one dollarette
SEPTEMBER 1974

73 magazine
for radio amateurs

FCC goes WILD!

FIVE DOCKETS RELEASED – *Full Text Inside*

The FCC has swung from the overly restrictive stance of last year to overt cooperation and interest in amateur problems and growth – blessings on Walker – on Chairman Wiley – on Johnny Johnston – and Gary Hendrickson. Yes, blessings on Walker! Things are looking up . . . read the full text of these Dockets in this issue and send in your comments. . .

- **UNATTENDED REPEATERS**

  Fallout from the January 14th FCC Amateur Hearing is this Docket to permit repeaters to be automatically controlled.

- **REPEATER CROSSBANDING**

  More Hearing Fallout – the promised elimination of the restrictions against crossbanding. This may be the biggest shot in the arm imaginable for 220 MHz development.

- **COMMEMORATIVE STATIONS**

  Further relaxation of the FCC opposition to special call sign stations. Three more cheers !

- **SPECIAL CALLS FOR EXTRAS**

  This could make the Extra Class ticket **very** *desirable.*

- **DELETING STATION LOG REQUIREMENTS**

  Another needed change – more cheers!

inside . . .

MOSKEY – PROGRAMMABLE KEYER – 6m QRP RIG – CW/SSB NOISE LIMITER – WEATHER SATELLITE SSTV CONVERTER – IC TESTER – INFINITE ATTENUATOR – MODERN SELECT–O–JECT – WEATHER WARNING NET

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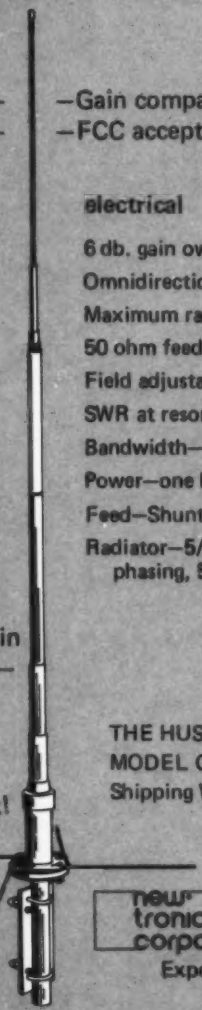

mechanical

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electrical

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73 magazine
for radio amateurs

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Amateur Radio

Monthly Ham

YL MARITIME OP

(ed note. . .Gloria Vader made the news recently as the first YL maritime op – she is the radio officer on the U.S. Geological Survey ship S.P. Lee out of Redwood City, California. A note from 73 asking her about this brought this reply. . .)

Thank you for your interest in my new career. I would like to see more women become interested in both ham radio and going to sea. I became interested in ham radio while living with friends on a schooner in Mexico. Their ham rig was communication with their friends in California who were helping them get materials for work on the boat. When they first bought the boat in Columbia they almost lost her on the way to the canal; but they contacted someone on the ham rig in New Jersey, who in a round about way got a hold of the Panamanian Coast Guard. The Coast Guard flew out a pump. Since then I've learned more about what a valuable communication tool amateur radio is and has been on land and sea. My ham experience helped me when I began to learn commercial operating procedures. Also, I was all ready familiar with the language of electronics, and it was easier to learn the servicing techniques I need for my job. So amateur radio has done a lot for me besides being an enjoyable hobby.

I'm enclosing a picture one of my friends in the crew took during an open house on the ship I don't usually wear a uniform as the atmosphere is more casual.

WB0KVL

HAM STATION FOR BLIND HAMS
Set up by local club

Blind amateurs who are taking the guide dog training course at the Blind Center in San Rafael CA now can talk through the local repeaters as a result of the kind work done by the members of the George S. Ladd Pioneer Radio Club in San Francisco. The club set up a G.E. Progress line rig and antenna for the school.

Watch for the station via WR6ABM or WR6ACS when you're in the area.

ED CLEGG AVAILABLE
(for talks)

Ed Clegg W2LOY is not only one of the top VHF equipment designers in the country, he is also one of the most enthusiastic supporters of the ham use of the 220MHz band. Remember that Clegg was the first out with a 220 transceiver – and with a 220MHz repeater. These were not put out with that CB band in mind – indeed they weren't ever designed to work with anything but ham use of the band.

The Clegg 220 repeaters are being set up in more and more areas, with the units in Totowa and Oakland, New Jersey being two of the latest. Many repeater clubs are going for the Clegg repeater/rig package, with the support of their local dealer.

Ed has been making trips to speak to clubs about the 220 band. If your club would be interested in hearing this expert of the experts you might have the program chairman get in touch with Carl Jacobsen at Clegg, 3050 Hempland, Lancaster PA 17601, and see if something can be arranged.

With the 2m repeater channels filling up in many areas, 220 is beginning to look better and better to a lot of groups.

HAMS AID SOAP BOX DERBY

The Kent County Repeater Association helped provide communications for the 13th annual Grand Rapids Soap Box Derby using 2m simplex. Public services such as this are of great value to the image of amateur radio. What has your club done?

SECOND ANNUAL HOBBIES EXHIBITION

More than 30,000 people visited the second annual hobbies exhibition sponsored recently by the "Sydney Morning Herald," Sydney, Australia. Several complete amateur stations were set up with a number of contacts made in Australia and New Zealand.

Dick Smith Electronics of Sydney provided the 80–10 meter SSB transceiver and three two meter stations as well as a complete electronics display and some 17,000 brochures on amateur radio and electronics.

Tom King, WA7DPO/VK2ATJ/T, left, manned the booth for 70 hours along with members of the University of New South Wales Amateur Radio Society, VK2BUV. Several hundred genuine enquiries on obtaining an Australian amateur license were answered.

HAM GEAR FOR JORDANIAN CLUBS

Anything you can spare in the way of ham gear, test equipment, good spare parts will be invaluable to the youngsters in Jordan. No junk, please – it is too costly to ship junk over there. Help a ham in Jordan to get on the air. Send equipment to: Royal Jordanian Radio Amateur Society, Royal Palace, Amman, Jordan; c/o Embassy of Jordan, 2319 Wyoming Avenue, Washington DC. Please send a copy of the equipment sent to 73 Magazine.

WS1ACR SPECIAL EVENTS STATION

The Newport County Radio Club will be operating this station in conjunction with the America's Cup Races through Sept. 30th. All bands, CW and SSB, plus 2m and AM on 6m. QSL to Box 36, Broadway Station, Newport RI 02840.

News Pages

EDITORIAL BY WAYNE GREEN

VIVA CASSETTES!

The Scott Joplin music from The Sting got to me right away – as it did millions of others – so I was ready, ready, ready when I got a call from an old friend offering a ticket to a Scott Joplin concert at Dartmouth in Hanover, New Hampshire. The New England Ragtime Ensemble was playing.

Not knowing that there would be any flack over my making a tape of the concert I arrived with a miniature Toshiba (KT-270) cassette recorder with a built in condenser mike and a lantern battery for extended drive since the little AA batteries it uses run out in about a half hour or so. I held the recorder in my lap about 150 feet from the stage, about half way back in an audience of about 2000.

They took the recorder away about an hour into the concert. Next time I try that I'll keep the recorder in a bag under the seat and use a small inconspicuous mike. Well, I did get an hour of a really fantastic concert, complete with the wonderful comments by Gunter Schuller, the conductor, and that was worth all the trouble.

I played the tape all the way home on the car hifi system which I originally set up for slow scan mobile operation. Since then I've gotten a couple records of the same group, but somehow they sound a lot better with the live audience – the performers get carried away by the enthusiasm of the listeners – it was mass hysteria – they kept Schuller and the group playing encores for almost an hour after the concert was supposed to be over – an incredible reaction.

The more I look into cassette tapes, the more convinced I am that they are going to be really big in a year or so. Not too many people realize that the state of the art has advanced now to where cassette tapes are comparable with the expensive reel to reel tape decks in fidelity. Cassettes have a lot to offer over records now. Even with the best of record players a record wears audibly after just a few plays – a tape does not wear, even if played on a real cheap recorder.

But what about the tremendous investment people have in records? I might give that more consideration if I had not suddenly found myself with hundreds upon hundreds of completely obsolete 78 rpm records a few years back. If they ever come back, I can retire.

Cassettes play just fine in a car, in a portable hand unit, or in the finest hi-fi player. There is no needle to jump, no vinyl to attract dirt and get scratched. Cassettes are easy to store – I carry around two little cases which hold 20 cassettes each in the car – 4" wide by 2-1/2" high by 10" long. I'll leave it to you as to how much room 40 albums would take in the car – make that 60 albums since the cassettes each have 60 minutes of music to 40 minutes per album. I'm not sure they would even fit in my little Datsun Z-car.

On records you can play any cut you want, how about cassettes? Most of the better recorders have a counter on them and with this you can cue in easier than you can find the right groove on a record. I put the counter reading on the cassette index and this allows me to go exactly to where I want in seconds. Most decks take a minute or even two for fast wind or rewind, but some of the newer ones have cut that down to 30 seconds for a half hour of tape! And they are virtually foolproof too. You can go from fast forward to fast rewind instantly without spilling or hurting the tape.

I predict that cassettes will be the major program source in five years. Let's see how I do with this one.

Eight track? No way. You can't reverse it and that endless tape system gets snagged much too easily. 8-track may possibly be around for pops about the way 45 rpm records are, or it may just go away in the face of cassette superiority.

The ability to tape music (or anything else) off the air – from borrowed records – from live concerts – or from other tapes in another big plus over vinyl records. The shortage of vinyl is another factor since cassettes take much less raw material – about 1-1/4 oz for a cassette to 4-1/2 oz for a record. That makes any 40 cassettes in the car weigh in at around three pounds and the sixty LP's with jackets at over 30 pounds.

Convinced?

WALKATHON ALTERNATIVES?

Walkathons are becoming very popular and quite a few ham clubs – particularly FM repeater groups – have been providing communications for them.

When I first heard about walkathons, I had a hard time believing that they would catch on – they seemed so totally unproductive – so completely wasteful. The idea of paying money to a charity because someone walks so many miles didn't make much sense. Other groups had tried getting people together to do positive things such as cleaning up roadways, rivers and streams, vacant lots, or to paint buildings, and this seemed a lot more reasonable to me.

If any of you look at things the way I do, perhaps you will have a chance to convert an incipient walkathon or bikathon into something more constructive. Then, not only will the participants get something of value done, but the charity money will help too. There are few communities where it would not be beneficial to have the beer cans picked up along the back roads – where there aren't houses that people would love to have painted for the cost of the paint and brushes – where enthusiastic, if inexperienced, help could help the community.

A little imagination will go a long way on projects like this. You may

W2NSD/1 cont'd on page 136

FCC NEWS

RM-2382

In the matter of

Amendment of Part 97 to delete certain amateur radio station log requirements.

Adopted: June 25, 1974

By the Commission:

1. The purpose of this Order is to amend the rules for the Amateur Radio Service to delete requirements for certain information to be entered into the log for an amateur radio station.

2. The Maryland FM Association, Inc., in petition RM-2382, requests amendment of §97.103 in order to effect such deletions. Petitioner claims the practical aspects of maintaining a station log at times can be very cumbersome and inconvenient. They point out other services regulated by the Commission where logs are not required, and question if amateur station logs are essential to the Commission's task in inspecting amateur stations and reviewing their operation.

3. The logs required by §97.103 do not, in fact, play a major role in the Commission's enforcement efforts, and we have no information on the role they play in the amateurs' self-enforcement efforts. A station log is sometimes presented to the Commission by an amateur operator attempting to prove, or disprove, some aspect of his past operation. For instance, he may wish to prove his station was not in operation during a period for which a complaint was received or a violation of the rules was observed. Or he may wish to prove he had accumulated the operating time required by §97.13(a) at the time of license renewal. A well kept log can, therefore, serve the amateur operator. For this reason, we feel most amateurs will probably continue to log data in addition to that required, a conclusion shared by the petitioner.

4. The present rules do provide exceptions to the logging requirements, most notably for those stations in mobile operation. The underlying purpose for this exception is safety considerations during times the amateur is simultaneously driving an automobile and operating an amateur station. There has been no noticeable impact resulting from this exception, and based upon this experience, it can be predicted there will be no significant degradation of the Service by extending the relaxation.

5. Petitioner recommends rule provisions such that, in specific instances, a station may be required to enter additional information into the log as may be deemed necessary by the Commission. We are in agreement with their suggestion. Furthermore, we believe the following should be logged: the location and dates for any operation, except mobile; signatures of visiting control operators; and third party traffic. Petitioner states his agreement with these requirements.

6. The amendments are given in the Appendix. It should be noted the requirements for logging certain technical data in §97.111(f) remains unchanged. The amendments adopted herein are editorial revisions, and deletions and relaxations of existing rules provisions which we consider no longer necessary. We believe they will inure to the benefit of many and to the detriment of none, and they will better serve the public interest. Therefore, prior notice of rule making and effective date requirements are unnecessary, pursuant to the Administrative Procedure and Judicial Review provisions of 5 U.S.C. 553(b)(3)(B).

7. Therefore, IT IS ORDERED, that, pursuant to §§4(i) and 303(j) and (r) of the Communications Act of 1934, as amended, Part 97 of the Commission's Rules and Regulations are amended as set forth in the attached Appendix, effective July 10, 1974. IT IS FURTHER ORDERED that RM-2382 is TERMINATED.

APPENDIX

§97.103 of Chapter I of Title 47 of the Code of Federal Regulation is amended to read as follows:

§97.103 Station log requirements.

An accurate legible account of station operation shall be entered into a log for each amateur radio station. The following items shall be entered as a minimum:

(a) The call sign of the station, the signature of the station licensee, or a photocopy of the station license.

(b) The locations and dates upon which fixed operation of the station was initiated and terminated. If applicable, the location and dates upon which portable operation was initiated and terminated at each location.

(1) The date and time periods the duty control operator for the station was other than the station licensee, and the signature and primary station call sign of that duty control operator.

(2) A notation of third party traffic sent or received, including names of all third parties, and a brief description of the traffic content. This entry may be in a form other than written, but one which can be readily transcribed by the licensee into written form.

(3) Upon direction of the Commission, additional information as directed shall be recorded in the station log.

NOTICE OF PROPOSED RULE MAKING

DOCKET NO. 20092

In the matter of

Amendment of Part 97 to make Special Call Signs available to stations licensed to Amateur Extra Class operators.

Adopted: June 26, 1974

By the Commission:

1. Notice of Proposed Rule Making is hereby given in the above captioned matter.

2. Frequently, the Commission receives a request from an amateur radio operator asking to have a specific call sign, or call sign format, assigned to his amateur radio station. The reasons given to justify these requests vary, but the requests in themselves indicate the very special significance a station call sign can hold for an amateur operator. Under the present rules, there are no provisions for satisfying requests of this type.

3. While we would like to be able to assign every amateur station the exact call sign of the licensee's choice, there are practical limitations imposed by administrative considerations. The assignment of station call signs on a request basis would require new processing systems requiring more clerical manpower, since most call sign assignments are now made by automatic data processing methods. Additionally, more manpower would be required to resolve conflicts arising from the inevitable cases of several amateurs desiring to obtain the same particular call sign. For reason such as these, under our present systems and resources, we could not possibly offer to assign call signs on a request basis to all of the 265,000 amateur radio stations now licensed.

4. Until such time as the necessary systems and resources may become available, we believe it is possible to satisfy at least some of these requests. The Amateur Extra Class deserves first consideration in this matter. This group represents the highest skill level licensed in the Amateur Radio Service. Since they also represent the operator class having the smallest

number of stations (over 14,000), and since many, if not most, of these stations already have preferred call signs or call signs of long standing, the number of requests for special call signs should come within reasonable limits. Making special call signs available to this group should provide amateurs, and the Commission, with information and experience in this matter so any future possibility of expanding the system can be better considered. Moreover, it would offer amateurs a way to obtain the call sign of their choice for their station.

5. Therefore, we propose to amend the applicable sections of Part 97, as shown in the Appendix. The current 25 year eligibility requirement for a 1X2 (single letter prefix, two letter suffix) call sign would be deleted. The amateurs meeting the 25 year requirement have had ample opportunity to exercise this option. The manpower recovered from deleting this provision can be applied to administering the proposed new system. Under these proposals, *any* Amateur Extra Class licensee would be eligible to apply for and receive *any* available station call sign of his choice, including 1X2, 1X3, or 2X3 formats, consistent with the numeral designated for the area. The limitations on only one 1X2 format call sign per licensee, except for those already holding more than one, would remain. However, the same licensee would be eligible to also hold one or more 1x3 or 2x3 format station call signs.

6. The proposals would undoubtedly result in the limited number of 1X2 format call signs becoming rapidly exhausted. This eventuality is only a few years off anyway, since the number of amateurs completing 25 years in the Amateur Radio Service should begin to increase sharply, reflecting changes in the operator license structure in the early 1950's. For this reason, we are proposing to delete the availability of in memoriam call signs to club stations. This will make a few more 1X2, and even desirable 1X3, format call signs available for the proposed system. Additionally, verification that the deceased former licensee was actually a member of the organization has, at times, been difficult for both the club and the Commission. Again, the manpower recovered from this deletion can be applied to the proposed new system.

7. The Commission has a number of petitions on file concerning the assignment of amateur station call signs. This proposal is not intended to preempt future consideration of those petitions. In fact, should our proposal be adopted, the resulting experience will enable us to better consider these petitions. Only call signs having prefixes in the series now normally assigned to primary and secondary stations would be available initially, although additional prefix series may be added at a future date. Available immediately would be those having the prefix K, W, WA and WB, in addition to those call signs normally assigned to stations not within the 48 contiguous United States. For stations outside the 48 contiguous United States, only a choice of call sign suffix could be made.

8. Authority for the proposed rule changes herein is contained in §§4(i) and 303 of the Communications Act of 1934, as amended.

9. Pursuant to applicable procedures set forth in §1.415 of the Commission's Rules, interested persons may file comments on or before October 9, 1974 and reply comments on or before October 24, 1974. All relevant and timely comments and reply comments will be considered by the Commission before final action is taken in this proceeding. In reaching its decision on the rules which are proposed herein, the Commission may also take into account other relevant information before it, in addition to the specific comments invited by this Notice.

10. In accordance with the provision of §1.419 of the Commission's Rules and Regulations, an original and 14 copies of all comments, pleadings, briefs or other documents shall be furnished the Commission.

11. All filings in this proceeding will be available for examination by interested parties during regular business hours in the Commission's public reference room at its headquarters in Washington, D.C., (1919 M Street, N.W.).

APPENDIX

Part 97, of Chapter I of Title 47 of the Code of Federal Regulations is amended as follows:

1. §97.51(a)(3) is deleted and reserved, and §97.51(a) and §97.51(a)(5) are amended to read as follows:

§97.51 Assignment of call signs.

(a) The Commission will systematically assign every amateur radio station a call sign consisting of a sequence of two letters, a numeral, and three letters, with the following exceptions:

(3) (Reserved)

(5) Upon request for a Special Call Sign, any available unassigned station call sign may be assigned to a primary or secondary station licensed to an Amateur Extra Class operator.

2. §97.53 is revised to read as follows:

§97.53 Policies and procedures applicable to the assignment of call signs.

(a) An eligible licensee will be permitted to hold only one two-letter call sign. However, licensees who, by reason of former rule provisions, presently hold more than one such call sign may continue to hold those call signs in the same call sign areas.

(b) Subject to availability, a primary station will be assigned the same type of call sign as the one relinquished, upon modification of license to show the fixed station operation location in a different call sign area.

(1) Stations will not be assigned specific call signs of the licensee's choice, nor counterpart call signs (call signs having identical suffix letters), under this provision. However these limitations will not preclude qualification for a Special Call Sign.

(2) When a two-letter call sign is not available in the new call sign area, an eligible licensee may be assigned an available unspecified three-letter call sign.

(c) Call signs which have been unassigned for more than one year will normally be available for reassignment.

FCC's FERRARO W3VGU RETIRES

Samuel J. Ferraro, Electronics Engineer in the Amateur and Citizens Division, is retiring on June 30, 1974, after thirty years of government service all with the Federal Communications Commission except for four years in the U.S. Navy during World War II.

Sam was responsible for much of the early repeater application processing and was most helpful in helping repeater groups through the maze of restrictive and conflicting regulations which managed to bog down about 90% of the early applications.

This job has now been taken over by Gary Hendrickson W3DTN, a repeater afficionado, and licenses are being processed under the new and much relaxed rules in record time. For example, one recent repeater license application went through and the call was issued in about 30 days! This was WR1ADX in Wolfeboro, New Hampshire.

Sam was ever helpful to amateurs and he will be missed, Perhaps in his retirement he will have more time to join us on the air. . .maybe on some of the repeaters he helped to license.

More FCC - Cont'd

450 BAND SECURE!
Emergency Medical Band Kaput

The FCC has announced the decision not to take any of the amateur 450MHz band for the Emergency Medical Service. A great sigh of relief has risen from the many groups with 450 repeaters and 450 control systems. The EMS will undoubtedly go right ahead, but on a much higher frequency band. This may be somewhat frustrating to Motorola, who we have heard has already produced some equipment designed for use in the proposed 450 EMS band.

AMSAT PRESENTATION BEFORE FCC

On July 9th Perry Kline of Amsat gave an interesting presentation before approximately 30 members of the FCC in Washington. That amateurs have been able to accomplish so much with such minimal expenditure is a continuing source of amazement to government officials. The fellows working on the Oscar projects beg, borrow and. . .ahem. . .just about everything from the solar panels to the batteries to the piggy back ride into space. One FCC insider said that the general reaction of the FCC people was that if Oscar wasn't up there right now they wouldn't believe that such a thing was possible.

REPEATER APPLICATIONS CONTINUING

978 repeaters were licensed as of July first. . .and 225 applications for more licenses were in hand at that time. . .all of them already processed by the Washington staff (Gary Hendrickson W3DTN). The FCC is beginning to wonder where all of these repeaters are going to be used. So are the frequency coordinator teams around the country. The elements for chaos are there. . .will the ARRL be able to keep things in hand now that they have successfully kept repeater councils from organizing into a group separate from the ARRL? Time will tell.

FCC's UNIVAC PROBLEMS

The amateur "service" apparently has won the honor of being the first to be transferred from the old Univac computer to the new computer system. A changeover like this never in history been made smoothly, so be prepared for difficulties for a year or two until things settle into place.

Terry Fox WB4JFI
3612 Barcroft View #302
Baileys Crossroads VA 22041

I have talked to several ATVers in our area that are having trouble picking up or transmitting to our repeater, and in every case it has turned out to be a problem in his setup. The UHF bands aren't that hard to work in, but more care must be taken in setting up a station than with the lower frequencies. Time after time I have seen a station using RG-58U as lead in, no balun, a commercial TV antenna polarized wrong, or some other poor hookup. I will try to show a basic setup that has been proven a good one again and again.

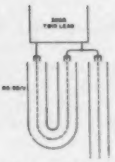
We'll start at the antenna. It should be one that has good gain, relatively high bandwidth, and rigid mechanical construction. It should be high enough to be out of the trees (we have one ham that was putting out a great signal until the trees by his antenna blossomed), however, UHF can run in sort of ducts, so you can get too high.

At the very least, RG-8U should be used, and it shouldn't be used much over 50 ft. Over 50 ft. lower loss cable should be used, because every db counts. This also shows that an antenna can get too high, because the loss in the cable will overcome the gain resulting in the increased height.

For receiving, the next item is going to be a balun. This should not be one of the commercially available ones, as at 450MHz they act as 10dB pads. One of the ATVers in this area came up with the design shown. It seems to work a lot better for us than any commercial ones that we've tried, and it's very easy to make.

If a preamp is needed, it will come next, and it should be designed for the ham band rather than for broadcast TV because they don't work too well on our frequencies. Also, more than about 20dB gain won't do you any good for the video link, from our experiences. There are several available that are advertised in 73, and any of these will work good on ATV, as long as you specify it's for TV use when ordering.

The receiving converter is possibly the most critical part of the whole station. The Blonder-Tongue converter seems to be the best approach at this time. We have compared them to the T-44 receiver strip, and the converter has won out every time. The T-44 just doesn't have comparable sensitivity, and it's not quite as broadbanded. The other possibility is a homebrew unit, but I feel that it's not worth the frustration when the Blonder-Tongue units are so readily available.



1. Cut 21cm (8 3/8") length of RG 59/U.
2. Make a loop and strip each end of jacket 1.5cm (1/2").
3. Take a piece of RG 59/U of any needed length and strip one end 1.5cm (1/2").
4. Unbraid three outer braids of stripped ends and solder together. Do not overheat.
5. Take piece of 300Ω twin-lead and strip one end 1.5cm (1/2").
6. Solder one side of the twin-lead to the inner conductor of one side of the loop and the inner conductor of the random length of RG-59/U.
7. Solder the inner conductor of the other side of the loop to the other lead of the 300Ω twin-lead.
8. Use black vinyl tape to cover connections and hold loop to random length of RG-59/U.
9. Make continuity check with ohm meter — both leads of other end of twin-lead will be connected to center of coax and no connection will be made to braid.

The last section for receiving is the TV set, which should have good sensitivity on channel 2 or 3 whichever you choose for the i-f into it. I have a black and white set that I use only for ATV, so it's tuned up for best sensitivity on channel 2, which is the i-f out of my converter.

The transmitter can be a RCA CMU-15, Motorola T-44, or a homebrew transmitter. As far as we can tell, the CMU-15 with the WØMZL modulator seems to put out the best overall picture. The T-44 is close, but it isn't quite as good for resolution. Not only that but the T-44 needs a more sophisticated power supply. In any case, I highly recommend the WØMZL modulator for any transmitter. Another word of caution regarding the T-44, some have the normal 15 pins, while a few have 18 pins, so check your unit before hooking the power up.

Several hams interested in ATV have been visiting the D.C. area and

ATV Raster - Cont'd

while here have contacted us and have been shown the ATV repeater. If anyone is interested in ATV, and is visiting D.C. please get in touch and we'll be glad to show off the machine itself, and what it looks like on the air from a home QTH.

Some interesting integrated circuits have been introduced recently, and I'm sure the more advanced ATVers will be very happy to hear about them. Two that I've heard about are both sync generators. One is the Fairchild 3261, which is available in both black and white ($35.00), and color ($47.00) versions. While this may seem kind of high at first, when you realize that all you need besides this chip is a 14MHz clock and a couple transistors for a complete broadcast-grade house sync generator, the price seems a lot better. The other sync gen chip is made by National, and its number is MM-5320. I haven't been able to get a spec sheet on it yet, but I think it's probably very similar. I will be writing more about these as I experiment with them. Another cute little device that I'm playing with is a Motorola MC 1445G. This is a high bandwidth video switch, and it lends itself very nicely to being the key part of a special effects generator (pun intended). Anyone interested in playing with this IC should ask Motorola for applications note number AN-491, as it explains how to properly use the chip.

Another area of interest to ATVers seems to be a relatively low cost 450 band solid-state transmitter with both audio and video. I'm sure there is someone out there that can work on this, as it would be of great value to the expansion of ATV. Again I am playing with some circuits for this but I have so many other things going on that I have no idea when it would be completed. From what I can tell, it would probably be best to start around 109MHz and double twice. This way you not only don't interface with 2 meters, but you also don't put junk out on TV channel 4. We have had this to be our only interference problem, and we traced it to the 72MHz stage in the T-44.

I guess I'll wrap this up for now and continue next month. Till then: BCNU on 439 ATV.

...WB4JFI

HARRISBURG PA

Sunday, Sept. 22, Park-N-Shop parking lot, 200 Block Walnut Street, Harrisburg — be there for the first high-rise hamfest in the world! 11 levels of parking — $2 per ham — 9AM — talkin on 94, 52 and 16-76.

QCWA NATIONAL CONVENTION

Disney World

October 25—26 — make plans now to attend this QCWA National. Write W4UKA, 635 SE 19, Ocala FL 32670.

MONTREAL AUG 4

Big Hamfest 9—5 on Sunday Aug 4th at MacDonald College Farm, Ste. Anne Bellevue, which is on the west end of Montreal Island. $2.50 admission. Talkin on 76, 58, 28—88, 46—06, and 6.40 7.18. Fleamarket, tech sessions, prizes, picnic.

SAN DIEGO NOV 1—3

ARRL SW Division convention — Town and Country Hotle — talk in 34-94, 3900, 7250. $5.50 registration, $9.75 banquet. Write Box 82297, San Diego CA 92138 for info and pre-registration details.

VA DX CONVENTION

Saturday Sept. 28, Sheraton Inn, Reston VA (near Washington). Sponsored by the National Capitol DX Association. Write DXpo 74, R1, Box 207A, White Plains MD 20695 for registration.

TACOMA HAMFEST

Aug. 17—18 at the Pierce County Fairgrounds, 11 mi south of Puyallup in Graham, Washington. Tech sessions, prizes, contests, flea market, displays. Registration $4, including dinner $7. Write Bill Morgan W7GPR, 3421 E 138, Tacoma WA 98446.

MEMPHIS TENN, OCT 6

The Mid-South Amateur Radio Association is sponsoring the Memphis Hamfest on Sunday October 6 at State Technical Institute, I-40 at Macon Rd (Exit 11). Seminars, demos, displays, XYL program, prizes, flea market, fun. Talk in 3980, 34/94, and Army Mars. Trailers and campers hookup at Welcome Inn across street. Holiday Inn there too.

RTTY ART CONTEST
Sept. 1 to Oct. 31, 1974

Entries in the contest should be sent to Don Royer WA6PIR, 16387 Mandalay Drive, Encino CA 91316. Send a five-level tape and five prints of each entry — as many entries as you want — winning entries will be published in 73 Magazine. Write Don with SASE for the full set of rules.

WINNIPEG MAN. OCT 5-6

Hamfest "74," International Inn, Winnipeg. Reg to VE4RL, Box 352, Winnipeg Man. Can. R3C 2H6 $1 ea. Dinner and dance Sat. $4 each. Hotel $24 couple special. Xmtr hunt, mobile contest, homebrew contest, XYL events, big prizes, auction.

WE4ARE SPECIAL EVENT STATION

Richmond Telecommunications Society sponsored booth at Atlantic Rural Exposition Sept. 19-29. Look on 3988, 7288, 146.88. QSL Box 842, Richmond VA 23207. Visitors can get nice prizes.

RESTON VA SEPT. 28

DXpo 74 — DX convention at Sheraton Inn, Reston VA sponsored by the National Capitol DX Association. Banquet, DX sessions, YL program, info: W3BWZ, RI B207A, White Plains MD 20695.

WEST GHENT NY OCT. 5

Northeast States 160 Meter Association annual fall meeting at Kozel's Restaurant, West Ghent (near Hudson). Flea market, dinner, prizes, starts 2 pm. Dinner $5.75 ea. — reservations: W1JEC, Box 44, West Granby CT 06090.

SO. SIOUX CITY NB, OCT 4-5-6

The ARRL Midwest Convention will be held at the Marina Inn, South Sioux City NB sponsored by the 3900 Club. Theme — tribute to handicapped amateurs. Friday noon start. QCWA dinner, portable repeater, SSTV, ATV, Amsat demo, QRP session, ARRL forum, repeater forum, traffic forum, flea market, Mars, exhibits. $7 reg to WØEQN 3818 5th Avenue, Sious City IA 51105. Banquet $6.

SHARON AUCTION SEPT. 15

The Sharon Amateur Radio Association is holding an auction on Sunday, September 15, at 1PM at the Sharon Community Center on Massapoag Avenue, Sharon MA. Free refreshments and doorprizes. Sell your own gear — we take 10%. For more info please contact Ed Levine WN1RFD, 6 Carlton Road, Sharon MA 02067. (617) 784-6033.

CINCINNATI OH SEPT. 15

The Greater Cincinnati Amateur Radio Association sponsors the Cincinnati Hamfest at Stricker's Grove (State Route 128, Ross). Dinner, contests, prizes, exhibits, beer, fun. $7 at the gate. Hot dogs and buns all day, donuts and coffee until noon, beer and pop all day. Dinner and supper from 11:30AM to 5:30PM.

Social Events cont'd on page 10

repeater update

Revision of Recently Published Repeater Atlas

ALABAMA

WB4QFV	Albertville	6.16-6.76
WB4QFF	Andalusia	6.34-6.94
WR4ABH	Montgomery	6.16-6.76
WR4AGN	Opelika	52.76-52.525
		6.34-6.94
WR4AEH	Tuscaloosa	6.22-6.82

ALASKA

WR7ACT	Anchorage	6.16-6.76

ARIZONA

WR7ACK	Bisbee	6.16-6.76
WR7ABL	Phoenix	7.80-7.90
WR7ACC	Phoenix	52.576-52.525
WR7ADG	Show Low	6.34-6.94
WR5ABF	Texarkana	6.22-6.82
WR7ABM	Tucson	6.34-6.94

ARKANSAS

WR5ADI	Little Rock	6.34-6.94
		6.10-6.70
		449.45-444.20
WA5BRF	Hot Springs	6.28-6.88

CALIFORNIA

WR6ADI	Auburn	6.16-6.76
WB1WY	Canoga Park	6.31-6.91
WR6ACI	Crestline	6.25-6.85
		6.19-6.79
WR6ICB	Eureka	6.34-6.94
WR6DGJ	Eureka	6.34-6.94
		6.94-7.48
WGJPU	Fresno	6.12-7.71
		6.22-6.82
WGPXP	Fresno	6.19-6.79
WR6AFA	Fresno	7.90-7.30
WR6ABV	Los Angeles PL	7.78-7.18
		442-450
WR6ABC	Los Angeles	222.34-223.94
WR6AEG	Los Angeles PL	7.86-7.96
WA6UJS	Los Angeles	52.76-52.525
WR6ADG	Los Angeles	6.34-6.94
		7.75-7.15
		225.54-224.14
WR6ACY	Los Angeles	6.76-6.16
W6NRY	Los Angeles	222.38-224.98
		442.30-449.85
WB6KKO	Los Angeles	222.70-224.30
K6ZJS	Los Angeles	222.80-224.90
WR6ADL	Los Angeles	223.02-224.62
WR6ABJ	Los Angeles	223.14-224.74
WB6MYH	Los Angeles	223.38-224.90
W6FHF	Los Angeles	443.15-448.55
WA6NIU	Los Angeles	443.25-448.25
WA6ZQD	Monterey	6.37-6.97
		449.70-444.70
WB6ZRR	Novato	6.40-7.51
WB6NDJ	Oakland	6.28-6.88
WR6ADP	Orange Co.	53.38-53.72
WB6VTM	Orange Co.	222.30-223.90
WR6ABO	Palos Verdes T1.8	223.34-224.94
WR6ACH	Paradise	7.99-7.39
WR6ACO	Pine Cove	7.75-7.15
WR6AEF	Pomona Valley	6.13-6.73
WR6ADU	Sacramento	6.19-6.79
WR6AEN	Sacramento	6.31-6.91
WR6AEI	Sacramento Valley	7.87-7.27
WA6ZQH	Sacramento Valley	7.78-7.18
W6NWG	San Diego	6.13-6.73
		444.30-449.425
WR6ACS	San Francisco	6.10-6.70
		448.25-443.25
WR6AEA	San Francisco Bay	6.25-6.85
WR6ADY	San Francisco Bay	6.25-6.85
WR6ABG	San Francisco Bay	7.93-7.33
WR6ADZ	San Francisco Bay	6.25-6.85
WB6CJR	Santa Clara	449.80-444.80
WR6AEB	Santa Maria	6.34-6.94
WR6ABR	Temple City (RACES)	7.72-7.12
WR6AFC	Thousand Oaks	6.25-6.85
WB6OPG	Tulare	6.16-6.76
		6.28-6.88
WR6AEY		6.34-6.94

COLORADO

WR6ADN	Canon City	6.22-6.82
WA6VTV	Colorado Springs	6.16-6.76
		443.80-448.80
WB6KJA	Colorado Springs	7.68-7.06
WR6ADS	Denver	7.09-7.69
WR6ABM	Denver (RACES)	6.82-7.30
WR6ACL	Denver	6.28-6.88
		6.04-6.64
WR6ADX	Denver	444.70-449.70
WR6ABN	Durango	6.34-6.94
W6PXZ	Grand Junction	6.14-7.94
WR6ACY	Grand Junction	6.34-6.94
WR6ADD	Greeley	6.25-6.85
		444.85-449.85
WR6ACR	Woodland Park	7.88-6.76
		7.94-6.88

CONNECTICUT

WR1AAD	Canton	7.96-7.36
		223.38-224.90
WR1ACY	Glastonbury	5.47-7.09
		52.72-52.42
		7.69-7.09
WR1ADK	Hartford	6.04-6.64
		443.10-448.10
WR1ADM	Naugatuck	7.78-7.18
		444.20-449.20
		22.86-24.46
W1WHZ	Norwalk	7.99-7.39
WR1ADN	New Fairfield	7.72-7.12
WR1ADL	Torrington	6.25-6.85
		443.15-448.15
WR1ADJ	Vernon	6.19-6.79
		443.30-448.30
		222.78-224.38

DELAWARE

WR3ABS	Delmar	6.22-6.82
WR4	Dover	6.19-6.79
WR3ABA	Wilmington	6.13-6.73

FLORIDA

WR4ABZ	Ft. Walton Beach T1.8	6.19-6.79
		6.34-6.79
WR4AES	Ft. Myers	6.19-6.79
WB4KBG	Melbourne	6.25-6.85
WR4AFI	Merritt Island	6.28-6.88
		6.34-6.88
WR4AFO	Orlando	6.16-6.76
		6.34-6.76
WR4AEQ	Orlando	7.78-7.18
WR4AER	Orlando	7.12-7.72
WR4ADL	Pensacola	6.22-6.82
		6.07-6.67
WR4AFW	Pensacola	6.01-6.61
WB4HAE	Tampa	6.16-6.76
		6.34-6.76

GEORGIA

WR4ABJ	Athens	6.13-6.73
K4DVJ	Dallas	6.25-6.85
WR4ABD	Mableton	6.13-6.73
		223.34-224.94
WR4AHB	Royston	6.19-6.79
WR4AFD	Warner Robins	6.25-6.85

HAWAII

WR6	Hilo	6.16-6.76
KH6EQF	Honolulu	6.28-6.88
KH6EQL	Waialva	6.28-6.88

IDAHO

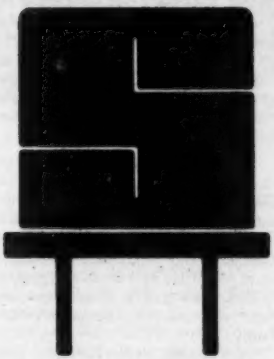
WR7ABG	Deer Point	6.34-6.94
WR7ACD	Driggs	6.34-6.94
WR7ACK	Twin Falls	6.16-6.76

ILLINOIS

WA9ZPT	Addison	6.31-6.91
WR9ACA	Alton	6.16-6.76
WR9ACB	Alton	6.19-6.79
WR9ACE	Aurora	7.49-7.81
WA9WVA	Batavia	6.04-6.58
		7.66-6.58
WA9GCK	Bloomington	6.22-6.82
WR9ADF	Bloomington	6.19-6.79
WR9ADE	Bloomington	6.22-6.94
WR9ABB	Chicago	448.6-443.6
		223.34-224.94
		1250.00-1289.00
WR9ACC	Chicago	6.10-6.85
WR9AAF	Chicago	6.34-6.94
WR9ABC	Chicago	6.37-6.97
WR9ACL	Chicago	7.00-7.60
WR9ACH	Chicago	7.09-7.69
WR9ACO	Chicago	7.12-7.72
WR9ABZ	Chicago	7.15-7.75
		7.45-7.75
		7.58-7.75
WB9IEZ	Chicago	7.87-7.27
WB9KCQ	Chicago	448.25-443.25
WB9ADT	Chicago	448.30-443.30
WA9TDR/9	Chicago	449.00-444.00
WR9ADC	Chicago	449.85-447.85
W9MJL/9	Danville	6.28-6.88
WR9ADG	Dixon	6.37-6.97
WB9SGJ	Flanagan	6.16-6.94
WR9ADH	Genoa	6.13-6.73
WR9ACS	Jacksonville	6.16-6.76
WR9AA	Joliet	6.28-6.987
		6.22-6.82
W9AZ	Kankakee	6.34-6.94
WB9AEU	Oaklawn	447.30-442.30
WB9JCL	Springfield	6.28-6.88
WR9ABH	Western Springs	223.38-224.98

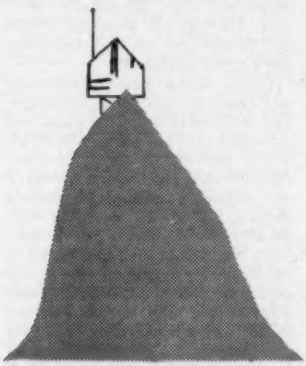
MORE NEXT MONTH

Send any and all corrections, updates or new listings to 73 Magazine, Peterborough NH 03458.



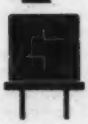
REPEATER OWNERS

Don't Take Chances. SENTRY offers custom made crystals made exactly to your specifications. When it comes to crystals for your repeater, BUY THE BEST – SENTRY.



REPEATER USERS

If you want reliable access to the repeaters in your area, you want and need SENTRY CRYSTALS. SENTRY CRYSTALS are custom made for your rig. We don't stock a large quantity of crystals for a certain frequency and hope you can tweak them to frequency in your rig. We do offer FAST service on crystals made especially for you and your rig. If you want reliable, on-frequency operation, INSIST ON SENTRY.



SENTRY MANUFACTURING COMPANY
Crystal Park, Chickasha, Oklahoma 73018

PHONE: (405) 224-6780
TWX-910-830-6425

Social Events - Cont'd From p.7

AURORA IL SEPT. 22

Fox River Radio League hamfest at Phillips Park, Aurora. Picnic, zoo, gardens, whole family, prizes. Talk in 146.94 and 52. Reg $1 to WB9HYH, 1888D Carnation Ct. Aurora IL 60506.

NASHVILLE SEPT. 1

Music City Hamfest at the National Guard Armory on Sidco Drive in Nashville TN. Dinner, prizes. Sponsored by the Nashville Amateur Radio Club.

EL PASO TX OCT 12-13

Hamfest and swapmeet – seminars, prizes, flea market. Info: WB5CMB, 7772 Gran Quivira, El Paso TX 79904.

WICHITA KS SEPT. 8

The Wichita Amateur Radio Club hamfest is Sept. 8th – no info on location. Write Secretary Agnes Niberger, 5450 Sullivan Ct, Wichita KS 67204.

MARION IND SEPT. 29

Grant County Amateur Radio Club annual Hamfest at the 4H Fairgrounds in Marion. $1 advance reg to W9EBN, Box 815, Marion IND 46952. Flea market, prizes, Bingo, camping, tech sessions, talk in 94 and 19/79.

MENA ARKANSAS SEPT. 7-8

Queen Wilhelmina Hamfest at Queen Wilhelmina State Park on Rich Mountain in Mena, Ark., Sat–Sun Sept 7-8.

GREYSLAKE IL SEPT. 14-15

Radio Expo '74 – flea market, camping, tech seminars and movies, food services, exhibits, at Lake County Fair Grounds, Rts. 45 and 120, Greyslake. $1.50 advanced reg to Radio Expo, Box 1014, Arlington Hts, IL 60006..

50 MHz BAND

Bill Turner WAØABI
Five Chestnut Court
St. Peters MO 63376

From Margate, Florida WB4OSN says, "Openings have been throughout the entire country. About the only area that has not been heard here is the Dakotas and Idaho. I had some real nice contacts with K7ZOK and a ragchew for over an hour with K7CIN. . .all signals were 5–9 plus all the time.

"The highlight of the month was: A response to a CQ on 50.075 (A1) by TG9KJ. Luis had a 559 signal here. He runs 10 watts into a 5-element Yagi. Luis is planning to have a Swan 250 on the air shortly. . .so be sure to listen for him. He made several more contacts and I believe that he made enough to apply for SMIRK membership.

"I had a QSO with Erik TI2NA on 10 meters. Erik is running a beacon on 50.095 from San Jose. He is also running a Swan 250. When we signed he was going outside to raise his 5-element Yagi to 50 feet. Erik has a rig at his office as well as at home so he should be a little more active. He plans to run the beacon continuously."

From Dallas, Perry WB5IKU says he has worked everything from KP4AHQ to VE3ONT since getting back on 6 after an absence of several years. . .says he has heard XE and TI stations but unable to work them through the pile up. South American TV also mentioned as being seen on almost a daily basis.

Ray K5ZMS/5 says SMIRK is up to 370 members in 41 states and 10 countries and recounts contacts and openings far too numerous to mention. Ray says you must call TI2NA on 50.150 due to the transmitter blocking the receiver(?)

Having worked both the June contest and field day using low power (about 10 watts output) I would like to make a few comments which should help the average station make more contacts and improve the lot of the increasing number of stations running low power. First and foremost. . .turn the knob. . .it is absolutely impossible for every station in the country to park on 50.110 and expect to make a reasonable quality contact. You may not hear anyone exactly on the same frequency but the station(s) on the other end may be hearing a dozen or more. Increase your ODDS by getting off 50.110. Probably the second most detrimental habit is repeating the called stations callsign over and over again. HE knows who HE is. . .he wants to know who YOU are. In the same vein, I am sure each of you has heard stations calling CQ for several minutes at a time boring those listening to the point that they look elsewhere for a contact. Keep "dupe" sheets, especially if you are involved in a multiop operation. Finally, check out your equipment before starting. Make sure it is working properly and is unlikely to malfunction in the middle of the operating period. Also make sure your rig SOUNDS good, without hum, carrier, reverb and the like.

WAØABI

GENAVE GTX-600
A Brand New 6 Meter Transceiver

As the two meter FM band fills up in most urban areas, repeater groups have been looking around for other bands to populate. Some have gone the 220MHz route – particularly now that Clegg has been delivering 220 repeaters – while others have been going to six meters.

The fact is that six has a whole lot to recommend it. The ground wave coverage on six is a lot better than two meters, with many repeater groups finding it up to half again as good in distance. Then there is the matter of band openings – they do happen on 2m, of course, but not with the regularity found on 6m. There is something wonderful about driving along in the car working one station after another over a 1500 mile path. From New Hampshire via the several New Hampshire 6m repeaters, contacts with Florida and the other southern states are very common.

Now, to get to the Genave rig – it is small enough to easily fit in the car – runs all the power you'll need for most applications – not that you can't add on one of those TPL amplifiers. But 30 watts is adequate. It has ten crystal controlled channels and comes with the national simplex channel all set to go – 52.525 MHz.

Genave, which makes a lot of stuff for aircraft, has put the special circuits into the 600 to keep down harmonic emission (so you won't be wiping out television for miles around as you drive).

Not bad for $309.95, eh? For details write: *Genave, 4141 Kingman Drive, Indianapolis IN 46226.*

MARK II

Hallicrafters introduces Mark II version of FPM-300 "Safari."

A new and improved version of its high performance, precision-built FPM-300 'Safari" SSB/CW amateur transceiver, the Mark II, is being introduced by the Hallicrafters Division of Wilcox Electric, Inc., Rolling Meadows, Illinois.

The new FPM-300 Mark II, like its predecessor, provides complete coverage for Single Side Band (SSB) and Continuous Wave (CW) operation

in the 80-, 40, -20-, 15-, and also 10 to 11 meter domestic and international amateur bands. Reliability and serviceability has been further stressed in the Mark II.

The Hallicrafters transceiver is a hybrid system using the most desirable features of solid state and tube circuitry in its design. It's a complete desk-top or under-the-dash/hump mounted mobile amateur radio station. The FPM-300 Mark II is intended for both domestic and international markets and has a built-in power supply for 117/234 VAC and 12 VDC power sources. Only an antenna and key or microphone are needed to place it in operation. Like the FPM-300 the low price of $625.00 has been maintained in the Mark II, according to the manufacturer.

The FPM-300 Mark II, Dimensions (HWD): 5½ x 12¾ x 10¾ inches; net weight 25 pounds. Additional data is available from Hallicrafters Division, Wilcox Electric, Inc., 600 Hicks Road, Rolling Meadows IL 60008. Phone 312-259-9600.

ANTENNA NOISE BRIDGE

The new R-X Noise Bridge by Palomar Engineers measures both resistive and reactive components of antenna impedance. The resonant frequency of an antenna as well as its feed point resistance is easily found.

The ability of the bridge to measure reactance is a useful feature not found in previously available noise bridges. The off-resonance impedance can be measured and it is easy to tell whether the resonant frequency is lower or higher than expected. This greatly simplifies tuning and matching.

The R-X Noise Bridge operates in the 1-100MHz range and measures resistance from 0-250 ohms. Price is $39.95 postpaid from *Palomar Engineers, P.O. Box 455, Escondido CA 92025.*

HALLICRAFTERS

Contrary to some irresponsible reports, Hallicrafters is not defunct, but is doing quite well, thank you. Hallicrafters was purchased recently by Wilcox and is a division of Wilcox Communications Equipment, 3151 Fibreglass Road, Kansas City KS 66115.

LETTERS

ou goons don't ever proofr
lousy
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you ignored my comments in
I insist that you print ev

AMATEUR RULES

In recognition of the invitation to write a letter to the editor abour proposed changes in amateur rules, I am hereby taking advantage thereof, by giving some views of my own.

We amateurs did well, utilizing three classes of license and it was a bunch of soreheads that wanted what everyone else (who made the effort) had in the way of operating privileges. FCC had not allowed phone operation by less than class "A" from 2050 KC/S to 28,500 KC/S. The 160 mtr band had been "appropriated" by 'Big Govt' and we could do nothing about it. So changes are made to open the previously exclusive phone bands to everyone, and lower the code requirements by adding the "Novice" class. Since Technician class must pass the same code test, they should have the privileges the Novice class have, too.

But this "cheap-skate" license and proposed doing away with code requirements completely, is the destruction of amateur radio. Every amateur ought to know the code, and be allowed to use CW anywhere in our bands. I feel the three licenses should be "Extra" class, (like the old class "A") General class (like old class "B"), and "Beginner" class but after a year, with an endorsement, it could be as General but the same as old class "C" which would make provisions for the ill, handicapped, aged and the like. Privileges should remain much the same as at present but up-grade the code test to 13 wpm and see that the horse comes first before the cart... CW gets first place as the basic mode of communicating with other methods after which require sophisticated equipment additions and give a better break in splitting frequency usage.

Perhaps all formal nets ought to be required to use a certain area of one band (the band used regularly by the net) to allow for general rag-chewing by others. In the case of separate PH/CW exams, it would place a serious burden on FCC and amateurs alike, when 2-way communication is not possible on phone in particular. "Sorry old man, I can't send CW, I don't know the code"...great. Shall we pursue the hobby by using semi-phore from hilltop to hilltop? When code is no longer needed so that the commercial telegraph test (license) is no more, only then will I agree to cut code from amateur radio. Also, AM is part and parcel of SSB-SC, and cannot be deleted. This is a hobby with many beneficial side effects to others, not a business enterprise and ought to be treated as a hobby. One may like CW, another phone, with any usable quality, while I like hi-fi, and there should be no restriction on building hi-fi receiving and transmitting gear. This should include AM and FM. For the nuts who now illegally play music on the bands, how about a segment somewhere that they can go? Please don't forget the "old men" who have held a class "A" ticket for many years, for they ought to be given "extra" status where they held the top grade of license before. As a last cra...I mean suggestion, let amateurs have 1 KW for the lowest class, 2 KW for the General class, and 3 KW for "Extra." The QRM isn't caused by low power stations. What if no transmitter could be manufactured for more than 1 KW, thus making amateurs build their own hi-power??

Robert Perkins Thayer W1PBE

I read with interest your "Getting Rich" comment on the opportunity existing for "Hams" in the installing and serviceing of security devices and systems.

While I do agree with you that the opportunity certainly does exist at this time, I think you might caution your readers to check into a few things like local and state laws before hanging out the shingle.

Most cities require a business license and some cities require qualification examination. Many cities require a contractors license, an examination, and a bond and some even require a state contractors license. In spite of all this, in an area where the competition is not too severe, it is still a good idea.

There are many applications that an alert "Ham" can come up with, but before investing in the equipment for the first job, just be sure that all local ordinances are compiled with so you won't find a "Stop Work Order" hung on a half finished job.

Francis L. Fuson K7VHS
Las Vegas NV 89102

Cont'd on p.132

Gus. M. Browning W4BPD
Drawer "DX"
Cordova SC 29039

The new DX season is just about upon us again, after a very poor (propagation-wise) summer. The sunspot situation is somewhat still debatable, it seems. Some say the worst is yet to come, others say "It won't be long now, etc." I guess we will just have to wait and see what happens from now on out. It seems that the real DXer, the fellow who is "in there" is still working plenty of good DX, even though conditions are a long way from being at their best. Of course, the Amstat DX workers are not bothered by the sunspot situation and there will soon be someone with an "Amstat" DXCC if they keep on plugging away. Of course, the WPX fellows always have plenty to chase. There is plenty for a DXer to do if he wants to keep busy and do a little "bookkeeping" so he will know where he stands in his various interests (I wish I had time to practice some of the stuff I preach!).

I have been asked by many people about this "country" business, such as what is a "country" and what is not a "country." Speaking for myself, personally the more there is the merrier, cut the mileage between the islands, count very state in the USA as another "country" (Russia has more countries than we do, and I don't think there is much more difference between their Soviets than there is between our states), and maybe some of the other larger countries could be cut up into two, three or more countries (provinces in Canada comes to mind, etc.). Our new Super WTW will be doing just this when we get it all organized and running, and we will count every island as another country as an example, every state in the USA, every province in Canada, Soviets in Russia (or maybe even each Oblisk), etc. We want a L-O-N-G list for the fellows to chase, something to keep them BUSY for a very long time, something that they will not catch up on for a long time. I know how some fellows feel about adding more to the country list, since they have them all right now. We want something going that cannot become "stagnated" on account of a fellow getting them all and working himself out of a job. The whole difficulty it seems is the poor choice of using the word "country" as a DX yardstick. In the English language there must be a better word that more fully describes DX, than the word country. I would like anyone who can come up with a better word to drop me a line and mention their choice to me, maybe in our small way we can get this word in circulation and start a new trend in the new DX world, and get rid of this debatable word "country" in describing our DX yardstick in the future. How about this fellows?

Jake CT2AZ, also WØJHY, is staying here with me for a while and did a lot of "listening" to the recent DXpedition to Kingman Reef (the most recent new DXCC). He gave me a blow by blow description of things as they were happening. I suppose most of you serious DXers were listening too and heard most of what was happening also. After it was all over and the boys were back on their way to Johnson Island to pick up some fuel oil and continue on to Hawaii, the story was more or less finished for that DXpedition. It seems that they had trouble first in finding Kingman Reef, and when they finally arrived at the reef sundown caught them and I suppose they pulled away from the reef area for the night (no ship Captain wants to be drifting around at night in the immediate area of a reef). Then they had the usual difficulties actually landing their equipment on the reef (it was about the size of a two-car garage, as it was described over the air), and not much above the high tide mark (I never did hear how it was during low tide. Maybe under the water?). The planned length of time for operation on the reef had to be cut due to a number of things that happened. Three of the fellows had to be back in Hawaii by a certain date so they could return to California and their jobs, it took longer to get to the reef than was planned and then they departed the reef one day before they had planned because of a sudden storm that came up. All this just proves that DXpedition plans just don't ever happen with perfect clockwork, even when the plans are made as carefully as possible. I guess just about now they are planning another assault on Kingman Reef next year (or maybe someone else later on this year). The low frequency gang is disappointed, I am sure, because the DXpedition did not get on for these fellows, due to the short stay on the reef. They did a very FB job for the length of time they were there though. The operators from the reef were: K6AHV, WB6OOL, W6OAT and WA9UCE. The call from the reef was KP6KR. I am sure many thousands hope they (or seomeone else) will return and stay much longer so that everyone will have a chance to add this one to their country worked list. You know when you are right up there at the DXCC Honor Roll level you just cannot miss even one new country or maybe you will be bumped from the list. Let's hope another, longer stay at Kingman Reef is right now in the planning stages by someone – and good luck to them.

I keep on receiving QSLs for various DXpeditions, and bootleg DX calls, addressed like this: W4BPD, QSL MGR., for so and so, etc. I again want to tell everyone, that I am not, never have been or will be a QSL manager for anyone, not even myself. QSLing to me is harder work than digging a ditch or cleaning up a WC. Don't let anyone, at anytime tell you that W4BPD is their QSL manager, because they are talking through their hat. I don't have time to answer these QSLs that are sent to me and they usually end up in my trash basket, unless a SASE is sent along with them. Then I just write on the card – not me! – and put it in the SASE and send it back to them. So I again say, don't send me cards for someone else! I have a heck of a time just answering those sent to me for my DXpeditions or home station.

A new station is active in Cambodia – XU1DX, has been worked on the low end of the 20m SSB band (around 14203) around 0033 GMT, probably active at other times too. DL6ZZ has worked W1MV 949 times (the 950th was an eye-ball QSO). Old MP4B has a new prefix – A9 (old MP4B is Bahrain Island in the Persian Gulf). ZA3ZP was worked by W9KM, he said to QSL via DJ6QT – my guess is another pirate, but his choice of QSL manager is pretty good if he is – maybe I am wrong, let's hope it is OK. Another new prefix is A6 – for the United Arab Emirates (something like the Old Trucial Omans I guess), but I understand that all the Old Trucial Oman states did not "join-up" with the new "Emirates." This may, possibly, make another change over there in the DXCC country situation. What do the few old Trucial States count for right now? And this brings up those other "State Like" places in The Hadhramaut (more or less North of Aden). They told me when I was over there that each one had its own Shiek and set of laws and the whole area was governed by each of these Shieks and no one else. Now here are about seven possible new ones (but, who will let anyone in to do the operating, maybe getting their throat cut in the deal! hi). Then there is that little known "neutral zone" at the Khyber Pass (I once went through the Khyber Pass). But, trying to find a place in those mountains to set up the rig would be a real problem, I can tell you!

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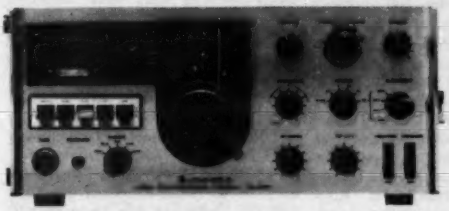

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The new TS-520 is the transceiver you have wanted, but could not buy until now. It is a non-compromise, do everything, go everywhere 5 band transceiver for SSB or CW that performs equally well at home, in an automobile, airplane, boat or trailer. The TS-520 features built-in AC power supply, built-in 12 volt DC power supply, built-in VOX with adjustable gain delay and anti-VOX. The price $629.00

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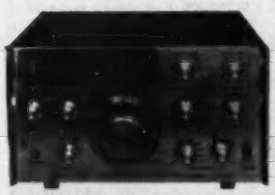

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Prices subject to change without notice.

A month or so ago FR7ZL/T was active from Tromelin Island (in the eastern part of the Indian Ocean, north of Reunion Island). The operator was Guy, who was having a heck of a time handling it all. He finally gave up and just pulled the switch. A few fellows suggested to me that he could have certainly used a "MC" or at least someone to make up a list for him to work by — or something!

It's nice to sit back over here and suggest such things, but you have to remember that some fellows don't want help from anyone. This is a good attitude for a DX station to have if he can handle the situation. I would suppose that since he was inside the USA portion of the band that he was stuck with transceive operation only and when you can only use transceive (working the fellows on your own frequency), then you do have a problem. Especially if English is a strange language to you. Also sometimes, on top of this, certain DX stations couldn't care less whether or not they work USA stations. In other words you need them but they don't need you! This is bad for the fellows back here that need Tromelin Island for a new country. Then there still exists the problem of getting the QSL card if you are lucky enough to work that elusive one. I guess that's why most DXers would much rather work a DXpedition who has a good QSL manager to handle his cards. It doesn't do too much good to work a "new one" and never get a QSL card.

I suppose many of you have heard of the untimely death of Hersh W5ZD. He was a DXer who knew his way around when it came to DXing. He had many, many friends and was always right in there handling some DX net or acting as a MC for a DX station. He was always glad to help anyone get a "new one" if possible and he was always loud, even overseas. He will be sadly missed in the DX world by all of us.

Another very well known DXer passed away a few months ago, Van WA9HUZ. He was very interested in DXing, especially in working the rare ones on 40m. His signals on 40m were always very good, I suppose he had a FB location or antenna or both for 40m. I so well remember that when I worked VAn from some rare spot when I was on 20m, his first question was, "When on 40m, Gus?" and when I got on 40m he was usually the first one I worked. A good DXer, many of us will miss his fine DX work.

WTW Contest

That's right, we are going to have a DX contest. Our contest will be different. The contest will run 48 hours (non-stop) starting Saturday morning (GMT), which is 7PM EST. Friday night on the east coast. Starting time is 0001GMT, October 19, 1974, and it ends at 2359GMT Sunday night October 20, 1974. The scoring system in our contest is very simple: work as many DX stations as possible, each contact will count as 10 points (any band, any mode, no QSL required — your word is OK with us — but we want to see a copy of your log. And, if, you work too many stations that no one else has worked we will be very suspicious, and we may publish the list of those certain "suspicious contacts" and everyone will know about you! Be careful Ole Buddy, please. The exchange with each station should be his call, contact number and report combined, such as 001579 (for your first CW contact) or if it's phone (SSB, SSTV, etc.) the number exchanged could be something like this: 00158 for the first contact (contact number 001-signal report 5/8), and that's all. Next we want his "handle" on each exchange (only QSO number, signal report, combined, and handle is total exchange). Your multiplier (each country) is 10 for each country. Any place that any national society or association or league calls a "country" is what we will call a country. You might check this part very carefully, because there is a good many places that others (than ARRL) call a country — such as European Turkey, Asiatic Turkey (by WAE?). The DUF counts the island of Ste. Marie off the coast of northeast Malagasy Republic. Also, don't overlook that our WTW list includes such spots as the Isle of Europa and Juan de Nova as separate countries. Also, we count Tristian da Cunha and Gough Island as separate countries. We will count any island that is over 100 miles from its nearest neighbor as a new one. These will give you something to more or less go by in doing your calculating on your scores in our WTW DX Contest. Just call CQWTW if you are one of these CQ callers! Please broadcast this contest to everyone you can, we would like for it to be a good, active one.

Since it is being announced rather late in the season we will need all the publicity we can get. We are going to have a WTW Contest every year from now on. So how about helping us get started off with a good loud "bang?" All scores should be received by me no later than Christmas day, December 25, 1974, and all the scores will be published in 73 Magazine a month or so after that.

I promise all of you that next month I will have a list (up to date) of our WTW DX areas (forget the word country). And, also a complete (as far as possible) list of our all new Super WTW DX areas. I will also be printing up these lists for you to use in your score keeping and other records. You will be able to use them when you send your WTW or Super WTW information to us. You keep one copy for your records and we keep one to add to when you submit new ones to us. You can start working on your scores right now because the regular WTW scores are for all contacts after 0001 GMT, May 1, 1966 and the Super WTW all contacts after 0001 GMT, January 1, 1960. Dig up those DX cards that DXCC will not accept as a new country (it is possible we will count them). We want you to be happy and we want you to have a big total!

Anytime any of you write me please be sure to send a SASE if you expect a reply to your inquiry. I try to answer all letters received, but sometimes it may take a little while to do this.

Lots of fun fellows messing around with these little ICs. Better try your luck with them and try to learn what they are all about and what they can do. Try making a few "printed circuits" fellows. They are a lot of fun and if you draw them out right, mount the parts in the right holes and solder correctly, the "gadget" will work the first time you apply voltage.

Anytime in the line of DX, DX ideas, DX working, sunspot stuff, DX antennas, DXpedition information, etc., is always needed here. Please remember us when you come across anythingthat you think would be of general interest to other DXers. This is your column and I want it to please as many of you as possible.

That's it for this month.

W4BPD

QSL CONTEST

The QSL winner this month is Eugene Sedberry W8JUL with a beautiful full color QSL card. On the back it says, "One of my bird friends and I discuss the weather, DX, what's for dinner and other subjects of serious mutual interest at Iron County QTH." A one-year subscription extension is the prize. How about your QSL? Is it different enough to win the monthly QSL contest? If not, why not? Your QSL expresses YOU! Are *you* special?

Bill Pasternak WA2HVK/6
14732 Blythe Street #17
Panorama City CA 91402

Bet you caught on by now that I am not trying to tell you how to put together your own remotely controlled amateur station. That would be far beyond the scope of this column. Rather, we are discussing the reasons that many Southern California FMers are still building these complex systems and installing them on our various mountain tops. To that end I spent a Sunday visiting with three of the most "together" hams I have ever met. If Skip, Mark and Gary are indicative of the caliber of amateur that are known as "Remote People," then our hobby is in pretty good shape.

On a number of occasions I have been asked by those unfamiliar with the remote scene if all these private systems were not using up valuable 450 repeater spectrum. About two years ago I might have felt that way, but after learning of the many technological developments that can be directly attributed to the Remote People I would be hard put to oppose what they are trying to accomplish. All I can say is that you have to experience what one of these systems can do to really appreciate it. In an earlier "Looking West," I said that the rest of the country grew up repeater oriented on 450 while we here in California grew up remote oriented. Today, the remote is as much a part of the FM scene in this part of the country as a good beam antenna is to the avid DXer. It's that simple and there seems to be little argument on this point within our amateur community. From time to time some dissent on certain things may arise between individuals, but they are usually settled by those involved.

Back to the interview. I had received a qualified yes to my question about remotes causing friction between amateurs from time to time. Skip Hansen WB6YMH continued, "You must remember that simplex, remotes and the technical type of people that inhabit them were here long before the first ham type transceiver ever appeared on the market. In those days, if you operated two meters you knew that FM existed, but if you operated mainly on the low bands you knew only that two meters existed. To be an FMer back then you also had to be a technician capable of converting commercial equipment to two meters, correlate your own crystals and things like that. Just about everyone ran commercial equipment and most of the activity was centered around .94. Well, suppose I am listening to .94 through the remote and I hear a simplex QSO up in Santa Barbara, but the signals only read one microvolt. Now a buddy out in the San Fernando Valley comes on running an HT. If Santa Barbara is reading only one microvolt to me, then I can assume my signal into that area will be comparable so I go ahead and answer the Valley station knowing that I won't be bothering that local Santa Barbara QSO. Well that's the way it was for many years with remotes and simplex sharing .94 with little problem. Then came the Two Meter FM fad with everyone running out to buy those cute little boxes all factory equipped with 146.94 simplex.

Let's put our hypothetical Joe Ham South of the San Fernando Valley in Santa Monica. Joe has just put out 300 big ones for his new toy and wants to see if it works. Eager to talk to someone he calls CQ or something like that, not realizing that he is now capturing the remote receiver and wiping out the Valley station. There is a mountain range running between Santa Monica and the Valley, so Joe could not hear the Valley HT. Our new FMer has made the same mistake that most newcomers to FM make. He has failed to listen first and learn the operating procedure for this band and mode. Sort of the same thing that you hear on repeaters these days when someone new shows up and there is the question of what repeater he is on. Well, I let him know what is happening and ask him to stand by until I am finished. In the beginning this worked, but as more of the appliance type operation began to appear on two the situation grew intollerable. Some confrontations did develop and eventually all but the most die-hard remote owner moved his system off 94. 46 was officially established as the area Remote Base Intercom Channel and that's the way it stands today."

"Skip, do you think that the current influx of 'Ham Type' 450 radios will cause a change in this area's 450 operating perameters? "I sincerely doubt it. Not with the long, well established operating perameters that exist on 450. This is the band where all special interest groups have a place and most of us get along pretty well. Basically we tend to respect one another as it's to the best interest of all concerned. To make an outsider believe that a repeater sub-band on 450 in this area is a totally unlivable handicap must seem absurd, but you know it's a fact of life.

A couple of years ago when 18803 was first being drawn up, an experiment was performed to determine just how much activity this area really had on 450. A particular Saturday evening was chosen and word was passed to all interested parties to transmit at a given hour. Someone was up on a mountain with a spectrum analyser and scope camera to record the results. The picture showed relative inactivity above and below the band with one solid wall of rf from 420 to 450 sitting at the 70dB mark. I was told that this picture was officially submitted to the FCC and rejected by them as not being believable. (ed note: If any of you have a copy of this picture and would not mind parting with it, I would be happy to print it in a future column. I have heard 450 and I believe.) But Bill, you yourself have heard how much 450 acitivity there is!"

"Can you see remote systems taking an active part in the development of 220MHz Skip?" I don't think so; the kind of interest that remote people have doesn't lie in that direction. Southern California is the only area I know of with a large number of remotes and the people on these systems are for the most part technically oriented not appliance operators. Most of us are really fed up with the type of operation that is two meters today. That's the reason you don't find them on .94 or many of the other two meter channels they used to operate. Unfortunately, with the lack of easily convertable equipment of the commercial variety for 220 along with the appliance type operation that is already developing, I don't think you will see many remote systems equipping themselves for that band. Honestly, what reason would a remote owner have to equip for a band on which he has nothing in common with the rest of its users? 220 is already developing into another two meters."

Are remote owners and remote people different from the rest of the amateur community? If the GFRN people are typical, then the answer is yes. First and most important, they are among that breed of amateurs, the builder-experimenters who are not afraid to get their hands dirty to make a dream into a reality. By today's "cute little box" standards, a remote is not a pretty looking thing. What radio rack is? To its builder it is a thing of beauty to behold and something to be proud of. Skip commented that in a way it is the fulfillment of an

ego trip. Well, call it what you like, the sophisticated systems we call remotes and the people that build them are today's pioneers. Docket 18803 almost spelled an end to the remote, but thankfully restrictions are now being eased so that development of sophisticated systems can continue. We sincerely hope that this trend on the part of the FCC will continue as they too recognize the contribution that these systems are capable of making to the overall picture of amateur radio.

So, if owning a Remotely Controlled Amateur Radio Station is an ego trip, and if it takes that kind of ego to lead to further experimentation and technological development then we in the amateur radio community need a lot more of that ego. No, the remotes and private systems that abound on 450 in this area are not wasteing valuable repeater spectrum. Rather they may hold the key to the future survival and growth of amateur radio. My thanks to the members of the Grand Funk Radio Network for making this article possible.

AMSAT NEWS

Michael Frye WB8LBP
640 Deauville Dr.
Dayton OH 45429

Launch of A-O-8 (AMSAT-OSCAR-7) is now scheduled for early October 1974. Launch date is determined by the readiness of OSCAR-7 and by the availability of NASA launch platforms. By the looks of things right now October is a pretty promising date.

AMSAT-OSCAR-7 is the first amateur satellite to be formally licensed as a space station in the Amateur Satellite Service. The previous six OSCAR satellites were all licensed under the authority of regular club station licenses (W6EE and WA3NDS) by letters authorizing their operation rather than by issuance of special licenses.

There has been a suggestion made by OSCAR-6 users to separate the voice and CW activity going through the satellite. Although the suggestion has been tabled by The Amateur Satellite Service Council for later discussion, I personally believe the proposal would greatly enhance the effectiveness of satellite communications. Comments on this subject or comments and suggestions in general are welcomed by AMSAT. Send to, AMSAT, P.O. Box 27, Washington, DC 20044.

Orbital Information

Orbit	Date (Sept)	Time (GMT)	Longitude of Eq. Crossing °W
8582	1	0032.9	56.6
8595	2	0127.9	70.3
8607	3	0027.8	55.3
8620	4	0122.7	69.0
8632	5	0022.7	54.0
8645	6	0117.6	67.7
8657	7	0017.5	52.7
8670	8	0112.5	66.4
8682	9	0012.4	51.4
8695	10	0107.3	65.2
8707	11	0007.3	50.1
8720	12	0102.2	63.9
8732	13	0002.1	48.9
8745	14	0057.0	62.6
8758	15	0152.0	76.3
8770	16	0051.9	61.3
8783	17	0146.8	75.0
8795	18	0046.8	60.0
8808	19	0141.7	73.8
8820	20	0041.6	58.7
8833	21	0136.6	72.5
8845	22	0036.5	57.5
8858	23	0131.4	71.2
8870	24	0031.4	56.2
8883	25	0126.3	69.9
8895	26	0026.2	54.9
8908	27	0121.2	68.6
8920	28	0021.1	53.6
8933	29	0116.0	67.4
8945	30	0016.0	52.3

WB8LBP

Don Ferris WB8JYX
308 E. Harry
Hazel Park MI 48030

Are you about to receive your novice ticket through the mail? Have you just passed your novice test and already received your ticket? Well don't get up tight at the thought of your first attempt to make a contact on the novice bands. With a little preparation as to precedures and equipment you can start your new venture into amateur radio with confidence and be assured that when other amateurs you have contacted talk about the A1 operators they have worked, your call will be among the top ones mentioned.

First of all is equipment. Even a newcomer to amateur radio should have certain basic equipment. If finances are not a problem then my advise is to purchase the best transceiver you can as a novice. Some well known and proven transceivers are; Heathkit HW-100, HW-101, SB-100, SB-101, SB-102... Yaesu FTDX 560, FTDX 570, FT101, FT401... SWAN 260, 270, 350, 500, 500cx...DRAKE TR3, TR4, TR4c... HALLICRAFTERS FPM 300... The overall purchase price will be somewhere between $225 and $750. The reason you will be further ahead by buying a good transceiver in the start are many. First of all your contacts per call ratio will be much higher with a good transceiver. Second the quality of most transceivers will give you an excellent receiver along with a transmitter which will be able to be reduced in power to 75W input and when you get your general class license or higher you can just raise the power level up to meet your needs. Most transceivers run between 180–550W input. Voltage times current gives you power input. Third is the ease of operation which a transceiver gives you, VFO built in, and other options you might not get with separate transmitter and receiver. Fourth and last is the fact that you will probably get more for your transceiver when you get ready to sell it than you could for separate transmitter and receiver.

Now if you are like most and can't afford a good transceiver you can still buy a good receiver and transmitter with excellent results in obtaining contacts on the air. One advantage to separate transmitter and receiver is you can transmit one frequency and receive on another. You should buy the best receiver you can afford then use your extra finances for your antenna, transmitter, SWR bridge, and TR switch. A good receiver should include a crystal calibrator at least 100kHz, dial readout to 5kHz, and at least 10 through 80m in 5 separate bands, sensitivity of .5mV or less and stability. Price range will be between $70 and $600. Novice transmitters are easy to find and most work quite well. Some of the better ones are: Heathkit DX 40, DX 60, DX 60A, DX 60B... Drake 2nt... Ten-Tec series and Eico... Prices range from $10 to $100... Many enjoyable hours can be had using crystal control in the novice bands but if you want more contacts per call you will want a VFO (variable frequency oscillator). Priced from $10 to $70.

A useful and time saving piece of equipment you should have is an SWR bridge (standing wave bridge). This device lets you know if your antenna is resonant at the operating frequency you are at and so will give you an idea of how much power you are putting out into your feedline from knowing where your bridge meter usually

Novice - Cont'd

reads. If you use separate transmitter and receiver you will need some way of switching from your transmitter to your receiver on one antenna. This is called a TR switch. You can find many kinds at your local radio store or homebrew one yourself from the ARRL Handbook.

Good receivers, transmitters and procedures are a must but even with all these you will not make many good contacts without a reliable, resonant antenna system. Commercially, many are available for multiband operations from 10–80m. You have your choice of a Hustler 4B TV... HY-GAIN 18 AVt WB... and Swan or Gotham... From experience and ease of assembly I find the Hustler 4BTV with or without the 75-s resonator for 80m preferable over the others. Prices between $25 and $90. If you would rather try your hand at homebrewing an antenna there are many ways you can go. My advise is to get hold of the ARRL antenna book or ARRL Handbook and go by their specifications. For simplicity and all around effectiveness you can make a dipole for each band you would like to use.

Procedures are not hard to learn if you are interested in becoming a good amateur operator in every sense of the word. First of all practice your code both sending and receiving every chance you get. You can never get too proficient at CW. Don't be afraid to take criticism of your sending and learn from those criticisms. Go into each session of code practice with the attitude that it's fun and you are working towards a goal of a permanent amateur license of general or higher and don't get frustrated by mild setbacks in speed. Don't be afraid of working other than novices on the air. Your speed will zoom if you make it a practice to work those a little faster than yourself.

For the first time on the air, here are a few pointers that may make your hand less jittery and your stomach less fluttery. Be organized, give yourself room and be comfortable. Use a dummy load to pretune your transmitter then put on your antenna for the band you are about to work. Now take out a clean sheet of unused paper and have a couple sharp pencils handy besides the one you are using. Listen on the band you are about to use to see if there are any other amateurs calling CQ. If there are then by all means answer a CQ before you send one. The other amateur will or should call CQ CQ CQ de wN8??? wN8??? CQ CQ CQ de wN8??? wN8??? K. While he is sending write down his call and put in a crystal as close to his frequency as you can. (Make sure no one can be heard on your crystal frequency.) When he sends K you turn your transmitter to transmit and send wN8??? wN8??? de wN8??? (your call) ar of you are within 2kHz of his frequency. If you are further than that give him a longer call like wN8??? wN8??? wN8??? wN8??? de wN8xxx wN8xxx ar. Listen to see if you hear him calling your call then you can sit back and copy all that he sends as best you can. Probably something like: wN8xxx wN8xxx de wN8??? wN8??? tnx for the call om bt (-...-— ur rst RST is 579 579 bt qth is Detroit, Mich Detroit, Mich -...- name is bill bill hw? wN8xxx de wn8??? K Now it's your turn wN8??? de wn8xxx if you copied all his sending or at least got his name, qth and your rst send one R. If you missed anything then start right out by asking for a repeat of what you missed. Don't be ashamed to ask for a repeat of what you missed or for QRS, please send than how fast you can copy. If you got everything sent you can send the R tnx fer rprt bill -...- ur rst is 579 579 -...- my name is don don -...- qth is hazel park, Mich hazel park, Mich -...- wx is cloudy and cool abt 65 -...- HW? wn8??? de wn8xxx K If he got all you sent he should send R then continue the QSO. If you have a hard time thinking of what to say and send at the same time, sending from prewritten text is permissable to get you started. A few sample phrases follow: Wx is cool but should clear up by tomorrow; my rig is a drake 2 nt and rcvr a hq 110ac; I work at chevrolet in the die room; I work afternoons; I go to school at beecher high school; I got my novice ticket on may 14, 1974; How many countries have you worked? How long have you been a ham? You are my first contact as a ham, etc. etc., etc.

Make some of your own and use them until you get the hang of thinking and sending in unison, its worth the effort and it won't take you long. If you would like to end the QSO on your last transmission you will just say mni tnx fer fb QSO es 73 hpe cul ...-.- SKwN8??? de wN8xxx K listen for his final and ther was your first contact as an amateur. Wasn't hard was it?

Don't expect everyone you call to answer you and don't expect an answer every time you call CQ. If you got one you would be the first one ever to do so in the history of amateur radio. A nice percentage is about 30% as a novice if you use crystal control and 60% with a vfo. Get into as many contests as you can, they will help your code speed faster than any other way. The novice round-up is in February, the ss in November and any others you see listed in QST magazine. Send to the ARRL for all of their operating aids. RST report, countries list, and others.

I wish you many enjoyable years in amateur radio and many enjoyable hours now as a novice, just remember:

1. A few short cqs are better than one long one.
2. Don't expect to run your letters and words together and make contacts.
3. Log your air time immediately or you'll forget.
4. Keep your time in GMT so anyone you work will know exactly the day and time of your QSO.
5. Tune up on a dummy load.
6. Be honest with your rst reports so the other ham you work will know how you are hearing him.
7. Don't let amateur radio occupy so much of your time that you forget the world is still around you.
8. Don't be afraid to join clubs, send QSL cards and work contests, they will make you enjoy your hobby that much more.
9. Use common sense and give the other guy the benefit of the doubt and you'll get along not only in amateur radio but life as well.

...WB8JYX

HAM HELP

This column is for those needing help in obtaining their amateur radio license.

If you are interested, send *73* your name, address and phone number. Don't be bashful – remember, it's always easier when you have someone to give you that added bit of confidence.

73 would appreciate amateurs and clubs looking this list over and helping whoever they can. Do you remember when you needed help?

The following need some help – can *you* spare some time? Clubs in particular take note.

John Bernay, 306 Bower, Hot Springs AR 71901 (ph 501-624-3198)

Arthur Avillo, 5848 Garden Avenue Sp 49, Marysville CA 95401.

(Art is 62 yrs old and trying for Novice – asked SCM for help, got none – anyone out there to help him?)

If you need help, let 73 know – don't be bashful – the readers are solid gold and are anxious to help you. If you would like to help, let 73 know about that plus your area of expertise, if any, so we can list you for either general help or as a technical advisor.

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MOSKEY

A PROGRAMMABLE IAMIC CMOS KEYER

Part 1

The long desire to have a programmable CW keyer has been nourished many times by the recent articles in ham radio magazines. I have not been entirely satisfied with any of the circuits because they contained only Read Only Memories (ROM) which once programmed could not easily be changed, or those that did contain programmable memories were limited in storage capacity and not easily programmed. I decided to build a programmable keyer using read/write Random Access Memories (RAM) with a large storage capacity, 50 to 60 words, and make provisions for a ROM to be installed in it too, so I wouldn't have to reprogram frequent used phrases. After looking at all the keyer articles I could find that were published over the last few years, I defined the requirements for my ideal keyer.

The keyer I constructed in the spring of 1972 satisfied the following requirements:

1. The basic keyer should be an Iambic type with dot and dash memories for use with a squeeze paddle.

2. Letter and word spacing timing should be built into the keyer.

3. The keyer should contain a RAM programmable from the paddle.

4. Provisions for installing a ROM should be made so that permanent sequences could be stored in the keyer.

5. When sending from memory, either RAM or ROM, the stored sequence should be interruptable from the paddle at the end of a word space so that the sequence could be modified. This would allow the insertion of DX or FD, etc., into the stored sequence of CQ CQ CQ DE W1GCA giving CQ DX CQ DX CQ DX or CQ FD CQ FD CQ FD, or would allow the insertion of a signal report or station call sign into a transmission being sent from memory.When no further characters have been entered from the key, control would return back to memory.

6. The address counters for the RAM/ROM should be programmable from the front panel, via switches, so that different sequences stored in memory would be easily accessible.

7. When programming the keyer, it should enter an idling mode after storing a

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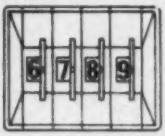

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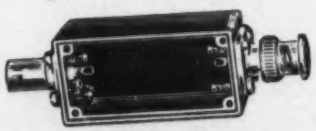

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word space in memory if no further dots or dashes have been entered from the key. This would prevent the memory from being needlessly filled with spaces when pausing at the end of a word.

8. A free running clock would be used and would have to be at a rate much faster than an element time unit (an element time unit defined as the period of a dot or the space between two dots) so that the keyer output would appear to start immediately after a key closure.

9. A repeat capability should be installed to allow a sequence such as CQ CQ CQ DE W1GCA W1GCA W1GCA CQ CQ CQ DE W1GCA W1GCA W1GCA K (stop) to be shortened to CQ CQ CQ DE W1GCA W1GCA W1GCA (repeat) K (stop). The repeat command would be executed once, and ignored the second time through the sequence.

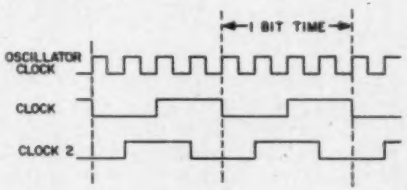

Fig. 1. The two phase clock used in MOSKEY.

I built such a keyer using SN7400 series TTL logic and received many comments on the "gud fist" on 40 CW. The "breadboard" keyer, setting on a TV tray in the shack, was used successfully for over a year. Since its original construction I made several improvements to it and decided to rebuild it using CMOS logic. This article describes the CMOS version which is currently in use.

Description

MOSKEY contains approximately 40 integrated circuits. The number can vary depending on whether you would like to install a Read Only Memory in addition to the programmable memory. This first part of the series describes the basic Iambic keyer with letter and word space capability, and the two phase clock generator. MOSKEY logic levels are in positive logic; a high = logic 1 = 5V, a low = logic zero = 0V.

The Basic Keyer

Figure 1 shows the relationship of the two phase free running clock used in the keyer. Clock 2 occurs in the middle of a bit time and is used to reset the dot latch and dash latch as each dot or dash is sent from the key. It is also used to generate the write pulse for storing information in memory, and to advance the memory address counter after writing into memory or reading from memory.

Fig. 2, is a block diagram of the basic Iambic keyer. It is simplified to the extent that no memory related functions are included. The keyer uses a 9 bit binary counter which is programmable to count either 256 or 512 clock pulses. A unit time element (which is a dot or the space between two dots) is the time required for the counter to count off 128 clock pulses. When a dot is sent, the counter is programmed to count off 256 clock pulses, the first 128 of which is the dot element with the output flip-flop turned on, and the second 128 clock pulses, the space element, with the output flip-flop turned off. When a dash is sent the counter is programmed to count off 512 clock pulses, the first 384 being the dash element, 3 time units in length (384 clocks ÷ 128 clocks/time unit = 3 time units) with the output flip-flop turned on and the last 128 clocks, the space element with the output flip-flop turned off. During the last bit time of the space element following a dot or a dash, the counter outputs an End of Instruction signal used by various parts of the keyer.

When the dot key is closed it will set the dot latch. This causes the selector latch to lock up in the dot mode, outputting a signal to the counter, starting a dot sequence to begin. The dash key can be closed, setting the dash latch, but the selector latch remains locked up in the dot mode. When the counter completes the dot, Clock 2 during the 2nd and 3rd quarter of the EOI bit time holds the dot latch reset and releases the selector latch. If the dash latch was set, the selector latch will flip states and lock up in the dash mode. This programs the counter to count off 512 clock pulses, outputting a dash and a space. At the end of the dash,

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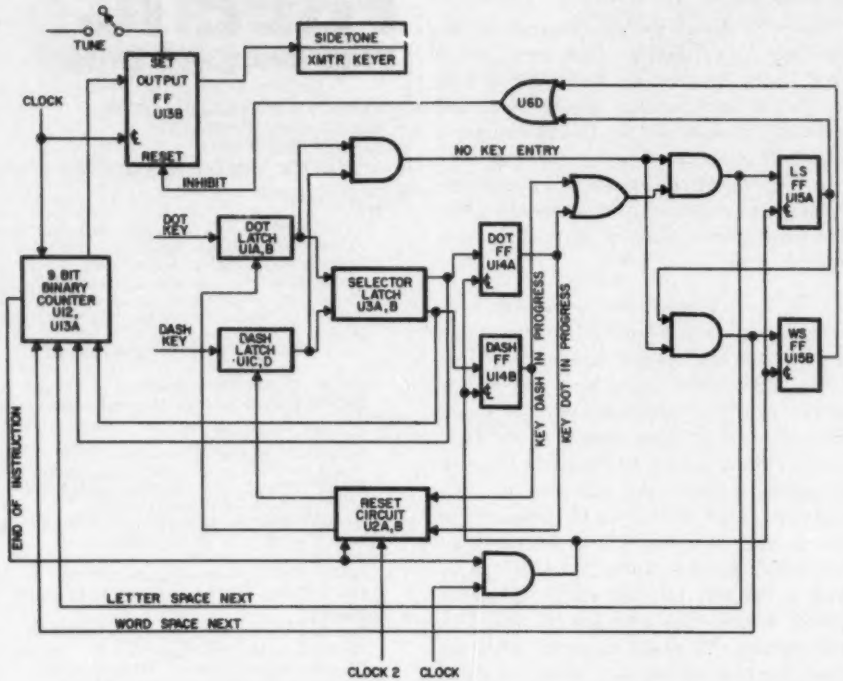


Fig. 2. Basic Iambic keyer. No memory related functions are shown. Schematic references are shown where appropriate.

EOI will go high and the reset circuitry will hold the dash latch reset during the 2nd and 3rd quarters of the EOI bit time and release the selector latch. The dot and dash latches permit alternating dot and dash outputs for Iambic operation if both the dot and the dash paddles are squeezed simultaneously. If 2 or more dots are desired the dot key is kept closed only. At the end of the dot, the dot latch is reset during the 2nd and 3rd quarters of the EOI bit time and the selector latch released. When the reset pulse goes away the dot latch will be set again during the 4th quarter of the EOI bit time and the selector latch locked up again in the dot mode. The dash circuit operates in the exact same manner. Also a dot can be inserted into a string of dashes by just squeezing the dot key and releasing it, while keeping the dash key closed. In a similar manner a dash can be inserted into a string of dots.

When the keyer completes a dot or a dash and there are no further entries from the key then both the dot latch and the dash latch will be cleared. Either KEY DOT IN PROGRESS or KEY DASH IN PROGRESS is high depending on the last character sent. This makes LETTER SPACE NEXT high and LETTER SPACE FF will get clocked high causing the keyer to begin a letter space sequence. The counter is programmed to count off 256 clock pulses, or 2 time units. Actually the keyer enters the dot mode and sends a dot, but INHIBIT keeps the output flip-flop from turning on and the keyer times out a 2 unit space. This 2 unit space when added to the space at the end of the dot or dash just sent gives a 3 unit letter space. When the letter space is complete and there are still no entries from the key then the keyer will begin a word space sequence and the word space flip-flop will be set. The counter is programmed to count off 512 clock pulses, or 4 time units. The keyer actually enters the dash mode,but again, INHIBIT keeps the output flip-flop from

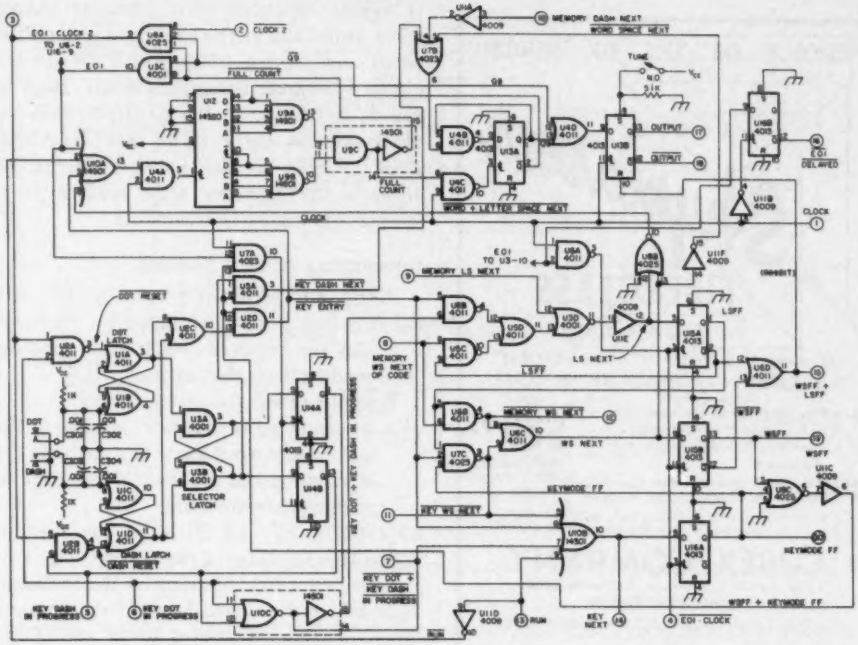
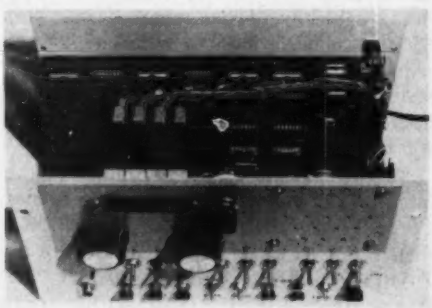


Fig. 3,

turning on. This 4 unit space when added to the previous 3 unit space gives a 7 unit word space.

If during the letter space sequence, an entry was made from the key, then after completing the letter space the keyer will not enter the word space mode, but send the dot or dash just entered. After completing a word space, if no entries have been made from the key, then the keyer goes into an idling mode. The 9 bit counter is shut off in the all 1's state and the keyer waits for a dot or dash entry to start it off again.



Top View of Moskey

The clock used in the keyer is free running all the time. If the keyer is idling and a dot or dash is entered from the key, as much as a full clock period could go by before the keyer begins to execute the dot or the dash. The output flip-flop is clocked ½ of a clock period after the keyer actually starts the dot or dash sequence. This means that the keyer output could be delayed as much as 1.5/128 time units after a key closure. This is only 1.15% of a unit time interval. I have not been able to notice any delay from a key entry to when the output actually starts, even at the slowest keying speeds. Nor have I experienced any problems with sending at high speeds.

The schematic for the basic part of the keyer is shown in Fig. 3. The circles with numbers in them are connections to other parts of the keyer. For example, all connections labeled number 1 are to be connected together when the final unit is assembled. There are several connections to the memory part of the circuit which have not been

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explained yet, but they will be covered in Part II of this series. C301 through C304 are rf bypass capacitors. I recommend placing C301 and C303 at the key input jack on the panel and placing C302 and C304 on the circuit card near the inputs to U1. Most of Fig. 3, is covered in the description of the block diagram, Fig. 2. U16B EOI DELAYED BAR is used in the memory circuit to advance the memory after reading from membry or writing into memory.

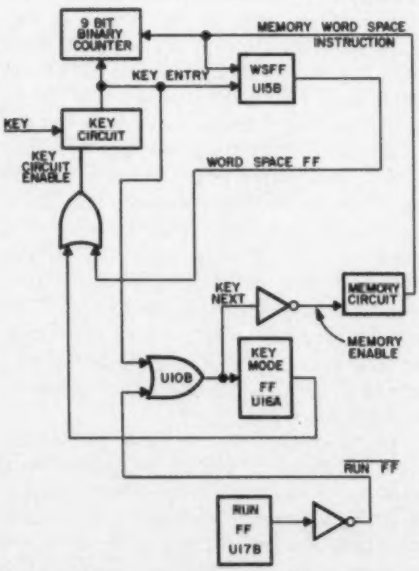


Fig. 4. Signal flow for a key interrupt at the end of any memory word space.

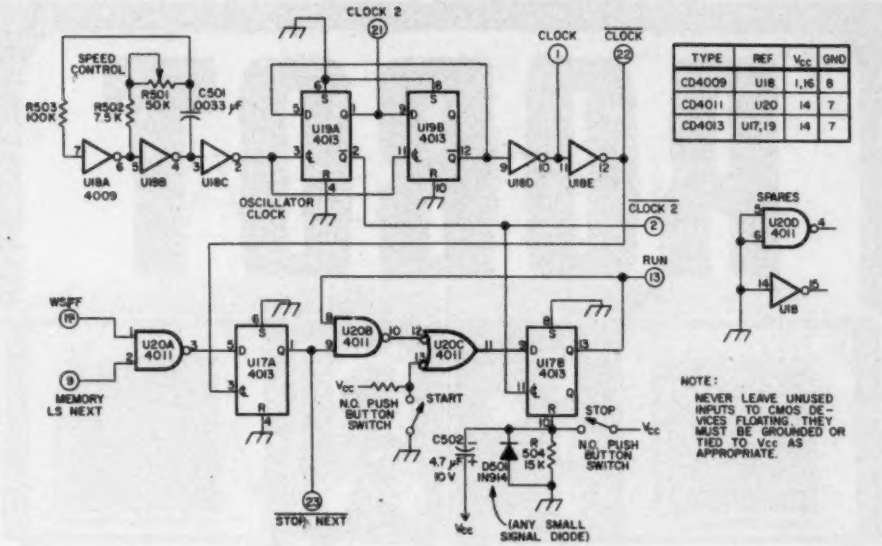
Interrupting Memory Sending

U16A KEYMODE FF is associated with the interrupt portion of the keyer. There are 3 modes the keyer can be in when sending;

1. sending from the key only.
2. sending from the memory only.
3. interrupting the memory sending at the end of any word space and enabling the key. When key entries stop, go back to sending from memory.

KEYMODE FF and RUN FF are used to define these 3 states of the keyer. Fig. 4, is a simplified block diagram of the interrupt logic involved to have inputs from the key interrupt memory sending at the end of any word space. During each word space sent from memory the key circuit is enabled and any previously stored dot or dash, which can be entered into the dot latch or dash latch at any time, or any entry during the word space will cause control to shift to the key at the end of the memory word space. The memory circuit is disabled and KEYMODE FF will be set. Control will remain from the key input until a word space is finally sent from the key and no new entries are made. (The key can remain in control for as long as desired as long as new entries are continued to be made before a key word space times out completely.) Then control will shift back to memory and the remainder of the sequence stored in memory will be sent. The memory can be interrupted as often as desired and no characters stored in memory will be lost or skipped.

As an example of the usefulness of the interrupt I have the following sequence stored in my PROM: "DE W1GCA TNX FER THE CALL OM BT UR RST IS HR IN ENFIELD, CT ENFIELD, CT BT NAME HR IS ED ED ED BT SO BK TO U DE W1GCA K (stop)." After having the keyer call CQ for me, and I get an answer, I



TYPE	REF	V_{cc}	GND
CD4009	U18	1,16	8
CD4011	U20	14	7
CD4013	U17,19	14	7

Fig. 5. Schematic of two phase clock generator and control circuit for starting and stopping memory sending.

send the station's call sign and press the START switch. The keyer picks up with "DE W1GCA TNX FER THE CALL OM BT UR RST IS." Then I insert his signal report from the key while I have had a chance to get half of the log book filled in. After sending the signal report, I go back to completing the log book while the keyer continues for me. When it sends "... SO BK TO U" I enter the station's call sign and then the keyer completes the transmission.

The clock circuit is shown in Fig. 5. U18A and B form the oscillator and U19 is a divide by 4 Johnson counter which generates the overlapping two phase clocks. R501, R502, and C501 are the frequency determining components of the oscillator and they can be varied to suit individual tastes. R503 is recommended for temperature and voltage stabilization of the oscillator and its value should be twice the total of the sum of R501 max and R502.

Again referring to Fig. 5, the RUN flip-flop is set when the keyer is sending from memory. When the start switch is pushed the flip-flop will be clocked high causing the memory circuits to be enabled. I will discuss in more detail the stop and repeat instructions in the next part of this series, but for now, when the keyer is sending a word space and MEMORY LETTER SPACE NEXT is high this is interpreted as a stop command. STOP NEXT BAR will be clocked low and RUN flip-flop will be clocked low terminating sending from memory. When power is turned on the RUN flip-flop could come up in either state and the keyer might start sending from memory. The power on reset circuit consisting of R504, C502 and D501 clears the RUN flip-flop on a power turn on. The stop switch can be used to manually terminate sending from memory.

The next part of this series will discuss the memory circuit and memory coding.

TYPE	REF	Vcc	GND
CD4001	U3	14	7
CD4009	W11	1,16	8
CD4011	U1, 2, 4, 5, 6	14	7
CD4013	U13,14,15,16	14	7
CD4023	U7	14	7
CD4025	U8	14	7
MC14501	U9,10	16	8
MC14520	U12	16	8

CD40XX are RCA part numbers. MC140XX are Motorola pin for pin equivalents – for example for U3, either RCA CD4001 or Motorola MC14001 can be used. MC145XX are Motorola parts only, no RCA substitute.

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A Ham Radio *Severe Weather* Warning Net

My experience with severe weather started in the late 50's with weather watch episodes as part of a Civil Defense system. Many nights were spent watching the dark skies and trying to locate tornadoes. Later, a fellow engineer, also a ham, whose home was damaged during the 1957 Kansas City tornado, suggested we work on an electronic means to detect tornadoes. I have been working toward that goal ever since. As will be explained, I think the key to this detection system may have been discovered.

The electrical monitoring of severe weather conditions is generally called "sferics" – an abbreviation for atmospheric electromagnetic radiation. Tremendous quantities of energy are released during thunderstorms in the form of electrical discharges. As with any type of electrical discharge there is electromagnetic radiation (radio waves) generated. For sferics, the radiation spectrum includes frequencies from 10 kHz up into the UHF bands. We hear a portion of this radiation on the ham bands and call it QRN. Although QRN is unwanted on the ham bands, it appears to be very useful to detect severe weather.

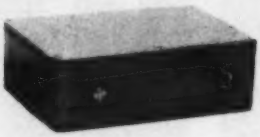
Many methods have been used to measure the sferics and attempt to determine a warning condition for severe weather. The simplest method is to measure the discharge rate. As the storm builds in intensity the discharge rate also increases. Recently, the use of a TV set has been described to monitor the VHF radiation from the tornado. More sophisticated methods have been used including: comparing activity at different frequencies and locating each discharge event via a multiple station direction finding system.

I decided to investigate the 10 kHz radiation because it is easier to work with and has a long range. My first attempt was a simple discharge rate measurement with a homemade strip chart recorder. The recorder indicated if the storm was getting stronger or dissipating but gave no indication of direction. If several storm fronts were within range, the discharge rate (sum of all fronts) was confusing. The next attempt was a scope monitor similar to the one that will be described later in this article. This provided some improvement in locating fronts but still no way of "labeling" a tornado. It was also necessary to watch the scope continuously in order to note activity and detect changes.

To reduce the chance of missing a tornado, circuitry was designed which

vhf uhf CONVERTERS

START HEARING the WEAK ONES ....



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translated the sferic events to a digital form which represented the direction of the event. This digital data was accumulated and stored in a memory. Periodically, this accumulation was read out and recorded. Now the sferics could be monitored and recorded continuously as the equipment operated unattended 24 hours a day.

With the accumulation of events per direction, the storm fronts could be followed from the Rockies to the Atlantic. Fronts from different directions were easily separated and each storm front intensity could be crudely measured. But, still nothing that could be used to label the front as capable of producing a tornado.

The Discovery

Last year I added circuitry to simultaneously display the amplitude and direction of each event in a rectangular coordinate form. The results of this improvement have been amazing. Several unexpected patterns were observed. With this display, each event appears as a dot representing the specific amplitude and direction of that event. When the events were accumulated (time exposure with a camera) a profile appeared as illustrated in Fig. 1. As the cloud formation progressed, four identifiable patterns became apparent from watching the display. During the initial stage, there were random events which had a definite amplitude-direction relationship (fell within the profile). This stage generally occurred for many hours. At the leading edge (A), there were no little signals.

During the second stage, one event appeared to trigger an adjacent event. This produced a "domino" effect with multiple events from one end of the formation to the other (e.g., A to B to C or D to C to B). These events appeared in sequence within the profile and would travel in either direction.

The third stage included the domino effect with the appearance of smaller signals at the leading edge (x's). Where previously there were no small signals, a variety of smaller signals would appear at the beginning or end of a domino sequence. These additional signals occurred from the leading edge direction. I think this condition indicated some probability of an impending tornado.

The last stage consisted of only signals from the leading edge location but of all amplitudes. The domino sequences seemed to disappear. This stage has rarely been observed and I think it indicates actual tornado.

Although the observations are real, the relationship to actual weather and cloud formation is only my speculation. I have many photographs showing the patterns but no positive correlation with actual tornado activity. There have been times when tornado activity was indicated by the monitor but none reported. Other times tornadoes have been reported but only high activity (not tornado) indicated by the monitor. Most of the time the monitor indicates high activity where severe weather and tornadoes have been reported. Of course, I cannot watch the monitor full time and do not have the time or facilities to track down reports or search for tornadoes which might not have been reported. After

you monitor severe weather for a while, you begin to wonder about the validity of many severe weather reports that are published by both the media and the weather bureau.

After some experience, I could estimate the severe weather location by noting the cold front position along with allowances for the general direction and speed that most storms travel. With my limited time and facilities, I have become frustrated trying to determine the meaning of these apparently orderly patterns from the sferics monitoring.

This monitoring system has now arrived at a point where help is needed. More stations are needed to pinpoint suspected cloud formations. Observers are needed to investigate both conditions indicated by the monitoring system and the severe weather reported by the public.

A Weather Net?

I have visualized a Ham Radio Severe Weather Warning Net. What a "feather" in our hat if we could develop a *reliable* tornado warning system for most of the country. There is a place in this system for everyone from the "meteorologist' to watch clouds and run down tornado reports to the "engineer" who could build and operate the monitoring equipment.

Let me describe my first thought about this system. I can see a club project to build and operate one of the somewhat complicated monitoring stations. Other interested persons could trace weather reports and observe actual weather conditions. There is also a need for a central data collecting and analyzing location. All of these separate operations would naturally be connected via the various ham bands (FM repeaters, SSB phone nets, and even possible automatic data transmission via RTTY or SSTV). It sounds like a big bite but I think the possible results are worth "having a go at it."

If my speculations are correct, I believe that this warning net could locate and *predict* tornado activity. Instead of warning a large area, the warning could be issued for only those within 20 to 50 miles of the indicated locations. Up-to-date predictions of activity as it moves along would also be available.

Monitor Characteristics

Monitoring equipment to detect the severe weather conditions can vary from a simple scope or CRT display of each discharge event as it happens, to computer type circuitry with memory capability to accumulate data from all events of a time period. Three displays and how they present a cloud formation are illustrated in Fig. 1.

All systems that I have used start with the same crossed-loop sense-wire antenna arrangement and three associated amplifiers, Fig. 1. If the loop amplifier outputs are applied to the CRT deflection plates and the sense amplifier output is applied to the CRT grid or intensification input, the direction of the incoming event can be displayed (polar display). Each event is displayed as a momentary trace from the center of the CRT outward in the direction of the received signal.

The next step in sophistication converts the signals from the three amplifiers into two signals. The two signals represent direction and amplitude. When these signals are applied to the horizontal and vertical plates, the horizontal axis becomes direction and the vertical axis becomes amplitude (rectangular amplitude-direction display). Each event appears as a dot at a location representing the specific amplitude and direction of the event. The domino sequences are very easy to observe with this display. This sounds like the end of the line but the eyeball-brain is still used as the observer-analyzer. When there are several formations to be observed, it seems that the eye is always looking in the wrong direction when something occurs. Obviously, some events are missed if they occur simultaneously. Several active fronts tend to light up the whole CRT and it becomes difficult to analyze each front. The human eye and brain are also poor for remembering and analyzing events that occur more than a few seconds apart.

When the speed and memory requirement exceed the human capability, we call in the "computer." The next step is to accumulate each event in channels which represent many specific amplitude and direction combinations. All events for each amplitude-direction combination are counted and the total count stored in a memory. Now each

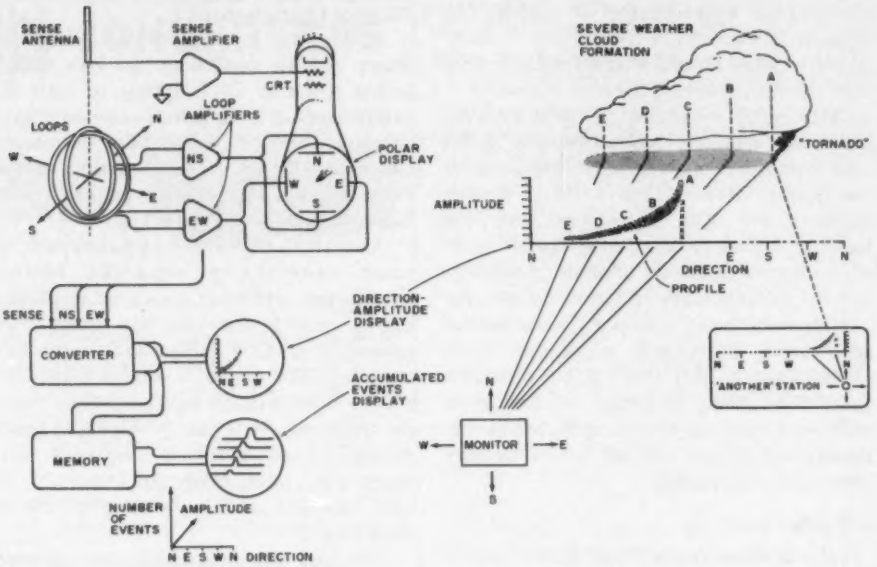

Fig. 1. Severe weather warning system.

event is "observed." The accumulation display, Fig. 1, provides a readout with a three dimensional effect. This accumulation presents trends and concentrations that are not noticeable during realtime observation. Low activity fronts that produce only a few events per minute in the early stages are easily detected. The accumulation also improves the directional accuracy since the average of many events can be measured. The best monitoring station appears to be a combination of the last two descriptions with the amplitude-direction display to detect the domino sequences and the accumulation circuitry to detect low activity and provide directional accuracy.

Monitor Description

The remainder of this article will describe a few highlights of a polar display monitor. This description is intended more for reference and information than for construction detail. Most of this monitor circuitry can also be used with the converter and memory units. The converter circuitry consists of about 6 op amps and several CMOS digital ICs. The memory unit is a little more involved with about two dozen digital ICs.

Loops

All monitors start with a set of loops. I have used two basic types as shown in Fig. 2. For several years I used the ferrite rod version mounted to the basement ceiling. After I moved these loops to the attic about the only difference noted was a reduction in interference from the electrical equipment in the house. I am now using the balanced version which gives about a five times improvement in sensitivity.

There are several important points concerning the construction and location of the loops that should be mentioned. First, it is very important to make both loops as identical as possible. Since there is no way to provide a direction calibrating source, the calibration must rely on a simulated input signal. If the loop amplifiers have identical response and the loops are also identical, then the direction display should be accurate.

Obviously, the loops should be aligned with the cardinal compass points as accurately as possible. Since it is difficult to construct crossed loops as illustrated in Fig. 1, the loops can be mounted several diameters apart. Note that the maximum

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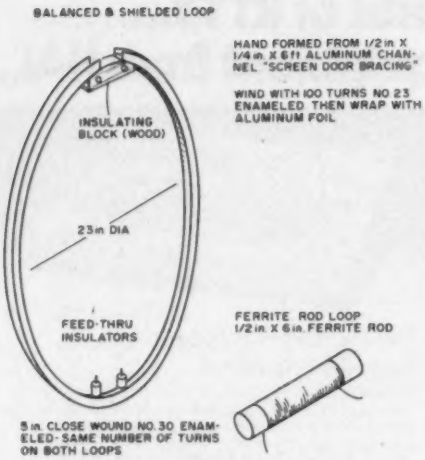
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WIND WITH 100 TURNS NO 23 ENAMELED THEN WRAP WITH ALUMINUM FOIL
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23in DIA
FEED-THRU INSULATORS
FERRITE ROD LOOP
1/2 in X 6 in FERRITE ROD
5 in CLOSE WOUND NO. 30 ENAMELED - SAME NUMBER OF TURNS ON BOTH LOOPS

Fig. 2. Loop construction.

pickup is in line with the loop *winding* plane, e.g., the N/S loop winding will form a circle as viewed from the east or west. The loops should be mounted clear of all metal, especially iron. Mounting height is not important other than to clear metal objects (known and *unknown*).

Theoretically, the distributed capacity and loading should be balanced and the loop winding shielded to prevent stray (electrostatic) pickup. From my experience with the two versions, I can't find a real need for balancing and shielding. It appears that the small ferrite loops are not large enough to have noticeable stray pickup. The larger loop performance might suffer without shielding but I am doubtful if the balancing is necessary. Improper loop pickup will only affect the direction accuracy and cause more elliptical traces but will not affect the sensitivity. This is an area where more experimentation might be fruitful.

The loop drawings in Fig. 2, should be self-explanatory. Remember to keep both loops identical. The shielding for the balanced loop must not form a shorted turn, e.g., both the channel and the aluminum foil must not be continuous at the top of the loop. Wire for the balanced loop can be obtained from Nurmi Electronic Supply, 1727 Donna Road, West Palm Beach FL 33401. Each loop requires about 1¼ lbs. of #23 enameled wire. I used a two wire shielded microphone cable for transmission line between the loops and the monitor. Cable capacity is not a problem. Other winding forms can be used as long as the total inductance is from 10 to 20 mH. In all cases the loops are tuned to 10 kHz. Other loop inductance requires changing the amplifier input to maintain a loaded Q around ten.

The sense wire is a simple antenna. It should be a vertical and as high as possible with a shielded lead-in. But, again, this isn't absolutely necessary. I use about 6.1 meters (20') of wire mounted about 61cm (2') above the roof of a one story house. There may be a disadvantage with a large sense antenna since it would be more sensitive to charge pickup from lightning. So far, I have not had circuit damage from lightning.

Loop Amplifier

The amplifiers are built around a favorite feedback circuit that uses two silicon transistors. This circuit has been very useful for me over the years. A few descriptive words are in order since the circuit can be used for other applications.

A typical circuit is shown in Fig. 3. Rb serves a dual purpose as both feedback and bias resistor. In most applications, the input base current is very small and the stage will reach a bias condition where the output voltage is nearly equal to the input base voltage. Since both transistor base junctions are in series, this steady state output voltage will be two diode drops or about 1.2V.

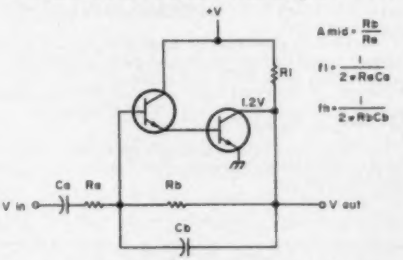

Fig. 3. Basic amplifier.

An input signal will cause a current to flow thru Ra. Since the amplifier gain is negative, this input current will cause an opposite polarity signal at the output. Some of this output signal will return via Rb to oppose the input current. This feedback action will tend to keep the voltage at the

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Ra-Rb junction from changing. If the amplifier gain is very high, the voltage change at the junction will be very small. This junction is now acting as a current summing point and is sometimes called a virtual ground – it appears like a ground since no signal voltage is apparent.

Since the Ra-Rb junction appears like a ground point, the input signal will appear across Ra-Ca and the output signal will appear across Rb-Cb. The mid-frequency gain becomes the ratio of Rb to Ra. The low and high frequency response is controlled by Ra-Ca and Rb-Cb, respectively. Both high and low cutoff frequencies (3dB down) occur at the frequency where the capacitive reactance is equal to the resistance ($R=1/2\pi FC$). For all practical purposes, these calculations are sufficient if the required stage gain is 30 or less. This circuit has proven stable with a variety of feedback arrangements, several of which are used in this monitor.

The loops are loaded with the amplifier input resistance (6.04k) and a second (6.04k to ground which maintains the loop balance, see Fig. 4. The total resistance across the loop is used to provide a loaded Q or about ten. This loaded Q is important since it determines the signal extracted from the broadband sferic wave front. High Q will cause the damped oscillation to continue for a long time and possibly override other events. Low Q does not provide a true L-C oscillation which could cause an error in the direction display.

The first two stages have the same gain and frequency response. Low frequency cutoff has been selected at 1000 kHz with the high frequency cutoff over 100 kHz. Total gain of the two stages is about 1000.

A gain switch has been included to provide some adjustment for larger signals Variable controls are unsatisfactory since both channels must have matched gain response at all times. More switch positions could be incorporated but I have found two positions adequate.

The deflection amplifier stage, shown in Fig. 4, includes a dual triode to provide the large voltage swings necessary for the CRT deflection plates. The triode sections are driven in a grounded grid configuration with the plate currents equal to the respective transistor collector currents. Essentially, the emitter currents are also equal to the collector and plate currents. The two emitter current paths come together and flow thru the 3.9k to the -8V power supply. Since the emitter voltage (Q6) can't change appreciably, the current thru the 3.9k will remain essentially constant. As a result, any increase (or decrease) in current thru one side of the amplifier will result in an equal decrease (or increase) in the other side or push-pull operation. The current thru the 2.2k de-

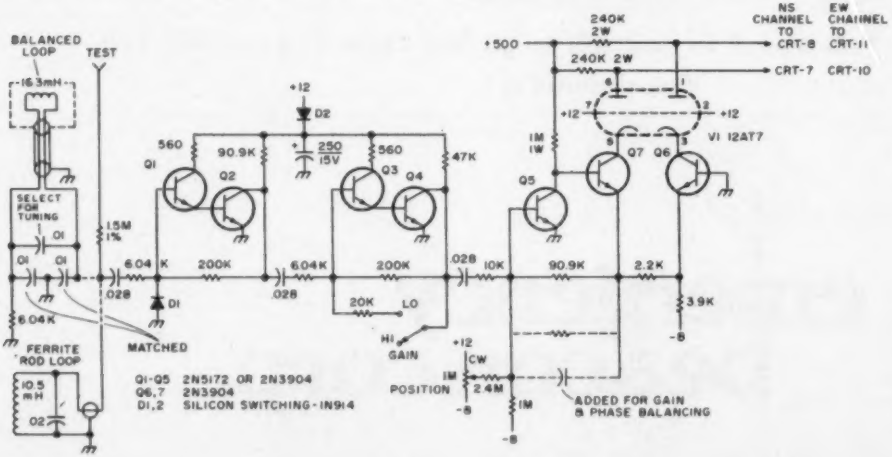

Fig. 4. Loop and deflection amplifiers.

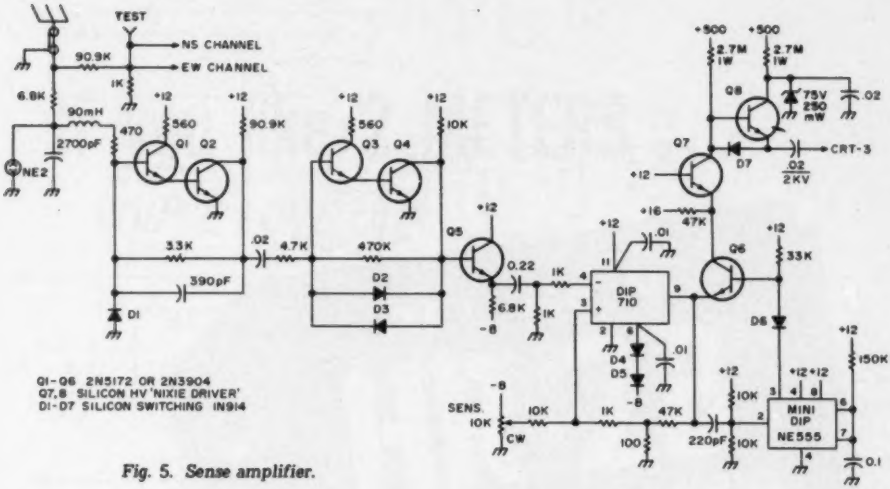

Fig. 5. Sense amplifier.

velops a voltage which causes a feedback current thru the 90.9k and the 10k. The Q5 base becomes a current summing point similar to the previous feedback discussion.

Sense Amplifier

The sense amplifier shown in Fig. 5, is a combination of several circuits. The input signal is generated by the antenna exciting the tuned circuit. A 90° phase shift is necessary to align the sense signal with the signals in the loops. This phase shift is accomplished by feeding the tuned circuit current (instead of voltage) to the input amplifier stage. The virtual ground or summing point characteristic of the basic amplifier is useful here. The 470Ω series resistance was necessary to lower the loaded Q to about ten. A neon bulb and diode have been added to protect the circuit from large overload signals (nearby lightning, etc.). The high frequency cutoff has been made as low as practicable to reduce local radio station interference.

The second stage is similar to the loop amplifier stages with the addition of diodes which limit or clip the signal. The diode clipping reduces the signal range to the comparator which provides easier sensitivity adjustment. These diodes, along with other apparently meaningless resistors in other amplifier stages, have been included to reduce overload effects from the very large signals.

The 710 IC is used as a conventional comparator with additional positive feedback thru the 47k and 100Ω resistors. The feedback improves the switching characteristics with the relatively slow (and noisy) 10 kHz signal. The minimum signal level necessary for intensification is adjusted by the SENS (sensitivity) control.

A NE555 timer IC has been used to block the intensification after the first cycle. If the blocking is not used, each event will be displayed with several traces as the signal from the input L-C circuit oscillation dies out. These additional traces tend to hide other events of lower amplitude. Without the blanking, the multiple events (domino) will appear very similar to the multiple traces from the damped oscillations. Even with the blanking, domino sequences are difficult to observe.

The remaining transistors provide a high voltage switching function to drive the CRT grid. Don't worry about the 500V supply to these transistors as it is clamped by the zener diode to a safe value. The two transistors (Q13 and 14) should have a Vceo of 100V. Most "nixie" driver types should be OK.

Power Supply and CRT

The power supply circuitry, in Fig. 6, is conventional. A larger-than-necessary scope transformer happened to be available. Series

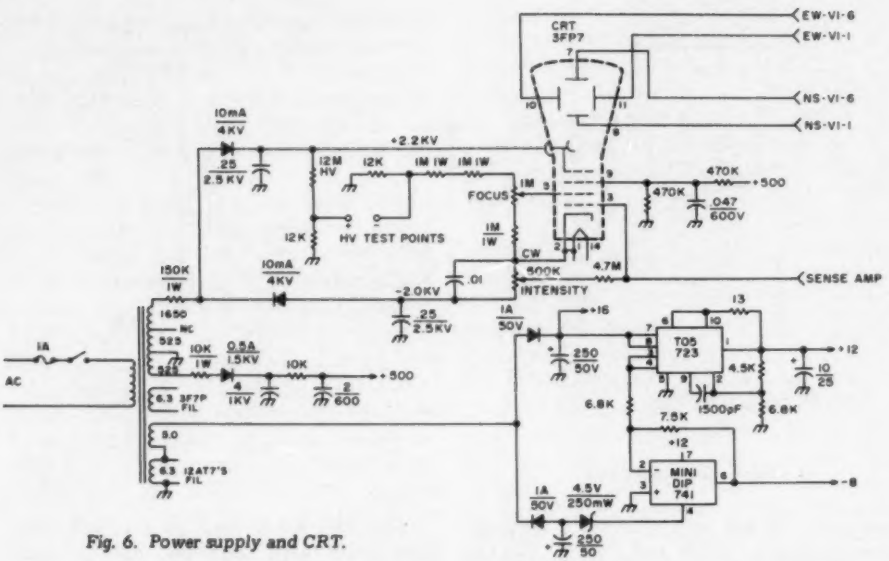

Fig. 6. Power supply and CRT.

resistors were added to both high voltage supplies to reduce the voltage to the values shown. Current requirements for the 500V supply is about 10mA so any transformer with similar voltages should be satisfactory. Remember, the filament winding for the CRT must be insulated for 2kV.

The accelerating voltage (4.2 kV) is necessary to provide the high beam current during intensification. Some scope circuits, with lower accelerating voltages, may not provide sufficient trace brightness. This CRT application differs from the average scope because the trace is only intensified during a single one-half cycle of the 10 kHz input signal or for only about 50 μs. Without sufficient accelerating voltage, it is difficult to maintain high trace brightness with decent focus. The CRT shown has a P7 phosphor (fast blue and slow orange) which also requires more beam current to excite the slow orange component. The slow orange trace gives the observer a little longer to judge the event. There is also some memory effect which helps compare successive events during high activity.

Construction

One construction detail which needs special attention is the separation and layout of the amplifier channels to eliminate cross coupling and pickup from the high voltage rectifiers. Any coupling between amplifiers may cause a direction error. This can be checked by temporarily shorting one amplifier input to ground. The trace should be aligned exactly with the other amplifier axis, e.g., short the E/W input and the trace should be vertical or N/S. Any deviation from the axis could indicate cross coupling or a misaligned CRT.

The component values shown in the schematics describe the actual components used. I happen to have a good precision resistor stock so several precision resistors have been used for stability and matching between channels. Again, it is necessary to make the two loop amplifiers as identical as practical. The corresponding feedback resistors (6.04k and 200k) and the coupling capacitors (.028) should be matched between the channels. The actual values are not too important but the matching between channels should be given some attention. Otherwise the circuitry is tolerant to some component substitution.

There is one feature which I do not have but should be considered. Since the events are only displayed momentarily, it is difficult to remember the location of the previous traces. It would be very useful to have

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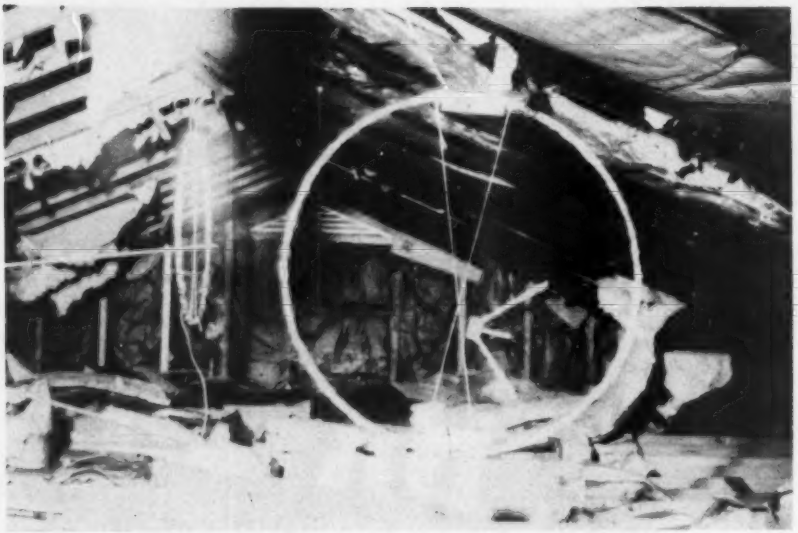


Balanced loops sharing attic with TV antenna.

several moveable index lines on the CRT face which could be used for reference. I have a hood in front of the CRT to shield the room light and haven't thought of a good way to add these index lines without defeating the hood purpose.

Adjustment

A 10 kHz sine wave (0-5V peak-to-peak) connected to the TEST input can be used to balance the amplifiers, adjust the sense tuned circuit, and tune the loops. The loop amplifiers are first balanced in the high gain switch position with the loops disconnected. During the balancing, the SENS control is turned counterclockwise (minimum sensitivity) and the INTENSITY control advanced for a visible trace. A parallel resistance and/or capacitance is added to the appropriate 90.9k resistor in the deflection amplifier circuit. The object of the balancing is to obtain a single line trace at exactly 45° (NE-SW). The amplifier gain (adjusted with resistance) affects the trace angle while the added capacitance (changes phase shift) corrects the double line or elliptical trace pattern. Start with about 300k and 10 pF variable components could be used but I prefer selection since there is no chance of accidental misadjustment.

After the amplifiers have been balanced in the high gain switch position, the low gain resistors can be selected following a similar procedure. Phase correction should not be necessary.

The loops are tuned by selecting capacitors to provide the same single line pattern. The low gain switch position should be used for loop tuning since the signal pickup with the loops connected will distort the trace in the high gain position. The loops should be mounted in position during the tuning.

The same test signal can be used to adjust the sense tuned circuit but the INTENSITY is reduced below the continous visible trace setting and the SENS is used to control the trace intensification. The sense antenna must be connected during the adjustment. With a suitable test signal level and SENS control setting, adjust the sense tuned circuit to intensify the trace equally in both directions from the CRT center. The SENS control setting will affect the distance of intensification from the center. Either the coil or the capacitance can be adjusted.

The loops must also be oriented for proper direction display on the CRT. If the socket pin notations on the schematic have been followed and the CRT mounted with pin 2 on the top, the following loop connections will give the standard direction display (north to the top, east to the right, etc.). The N/S loop should be connected so that the winding goes clockwise from the amplifier input to ground when looking to the west. Similarily, the E/W loop should go clockwise when facing north. Otherwise, it is a matter of connecting the loops and comparing the observed traces with the reported weather. There are only four possible loop connection combinations but it can be confusing if more than one weather front is within range.

Observation Notes

An ideal single event will appear as a line starting some distance from the CRT center (determined by the SENS setting) and pointing toward the signal source. The length of the trace (from center) is proportional to the signal amplitude. Some traces will be elliptical and others will be single lines. The elliptical patterns appear to be an effect of different signal paths. I think additional loop experimentation may be useful to clean up some of the elliptical patterns.

If the traces appear to intensify past the CRT center, readjust the sense tuned circuit until the intensification is as near the peak as possible. If no single line traces are observed, you should recheck the loop tuning and amplifier balance. The sporadic nature of the signals make much patience necessary to adjust and determine that the monitor is working correctly.

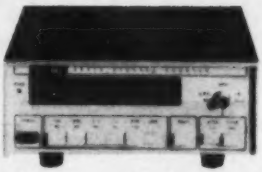
After all the adjustments have been completed, you can start to observe sferics. There is some activity throughout the year but the most active season is from early spring to late summer. Generally, the activity peaks during the early evening hours. The low activity may only be a few events per minute while during a storm the activity may reach several hundred per second.

Most cold fronts seem to generate sferics with activity starting from the low pressure location. As the intensity increases, the sferics activity spreads along the frontal line. This activity seems to concentrate at several locations along the line as indicated by the appearance of the domino sequences. The domino sequences are not easy to observe with this type of monitor. I would never have discovered the domino effect from this monitor only. Now that I know it exists, I can see sequences much of the time. There are several pointers that will help to observe these events. First, you have to imagine what the various amplitude-direction combinations should look like. This is relatively easy when the traces are single lines. But most of the time there is some elliptical effect. Second, you have to remember that the best "view" of the cloud formation is broadside. As an example, here in the Chicago area the fronts move predominantly from the west to the east. Therefore, the best 'view" is when the formations are either north or south of Chicago. The formations approaching from the west or leaving toward the east generate sferics from the same general direction and the profiles are not as noticeable. Many of the observing problems are cured with the converter unit.

As I mentioned, I think there is a good chance that a useful severe weather warning net can be developed by Ham Radio. If those interested would drop me a line (SASE please), indicating how they would like to get involved, e.g., organize a club monitoring station, observe weather, run down severe weather reports, coordinate local activities, build and checkout equipment, be available to operate monitoring stations, etc., I will try to put it all together. I won't promise to personally answer all letters, but I will try to keep everybody informed either by articles in "73" or bulletin mailings. At this time, I have no idea what response to expect and, therefore, I can't commit myself to any definite plan.

In some of my contacts with meteorologists and other persons in the scientific community, I have professed that the "hams" have the facilities and the enthusiasm to develop and evaluate this severe weather detection system. I cannot believe that I have over estimated our capability.

...W9DTW



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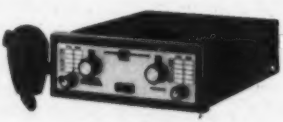

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THE AGITABLE

One irritating part of printed circuit board production is the frequent agitation required of the etchant if the foil is to be removed in a reasonable length of time. The etchant in contact with the board becomes saturated with copper and unless fresh etchant is brought to the area, the etching process is likely to become long and drawn out. The 5 by 7 in. photographic trays I use for this work are equipped with a three-point suspension which makes them easy to agitate if one has nothing else to do. But I for one would rather spend my hobby time doing something constructive. Hence, the following mechanical agitator.

The motor used was advertised as a "display" type and evidently was made for use in a store window display. Several mail order houses sell similar types for less than $2. This particular motor has a 1/4 in. output shaft turning at 10 rpm. Other diameters and speeds would require a slightly different treatment in order to achieve the desired result, but the principle remains the same. A shaft coupling was attached to the shaft with a longer than necessary roundhead screw.

The motor was mounted on the outside of a 7 x 9 x 2 in. chassis with the shaft sticking thru a 1 3/4 in. hole in the 7 in. side. Immediately above the coupling setscrew, a 3/8 in. hole was drilled to accept a standard panel bearing. A piece of 1/4 in. brass shaft (aluminum will do) was cut to a length which brought it flush with the top of the panel bushing when the bottom of the shaft was resting on the body of the coupling.

The bottom of the shaft was drilled and tapped for a 6-32 roundhead machine screw and oversize washer. (The washer keeps the shaft from coming completely out of the bearing.)

As the motor rotates, the screw on the shaft coupling contacts the screw on the shaft, forcing it upward approximately 3/16 in. The amount of stroke is adjusted by changing the length of the coupling screw. Do not attempt to lengthen the stroke too much? this can only lead to the screwheads locking up and stalling the motor. If the speed of your motor is such that more agitation is necessary, it would be far better to add a second (or third) screw in the coupling so as to produce several strokes per revolution.

Near the opposite end of the chassis, two rubber feet were mounted to coincide with the feet on the tray. The tray feet fit into the screw recesses in the rubber feet and keep the tray from wandering.

In operation, the shaft, which forms the third suspension point for the tray, raises the end of the tray. This causes waves of etchant to wash across the PC board. I have found this gadget to decrease etching time by up to 50% and at the same time leave me free to do other things around the shack.

... WAØABI

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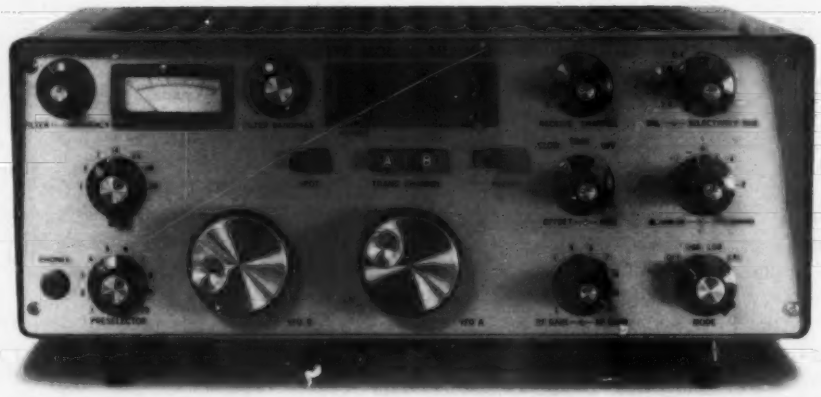

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LXpedition

Having found the Grand Duchy of Luxembourg a very pleasant place to stay and an uncrowded country, I decided to go again in a little DXpedition.

I had asked my friend Max (F8TH) and his wife to join me and had chosen Beaufort, where I had been before, and which I liked and where the hotel management had been very cooperative about antennas, etc.

As I had business to do in Luxembourg City and F8TH did not, we decided to meet at the Meyer Hotel, Beaufort.

Since it was only about 20 miles north of Luxembourg City, I did not hurry. I left fairly late in leisurely fashion and decided to get to Beaufort for lunch.

I thought I would have lunch and go on the air mobile after lunch and talk my friend in, as I had been there before and knew the neighborhood as he did not. We both had reciprocal licenses for Luxembourg, of course.

In this I was frustrated. As I drove up to the hotel I saw a car I thought I recognized and, although there was no antenna mounted on it at the time, I saw the letters F8TH.

So my friends had arrived before me. Inquiry at the reception desk led to the information they were in the room next to mine, and so I went straight up. In fact, they had arrived only a few minutes earlier. So all was going well. Max and his charming wife had brought their dog along; a dachshund called, appropriately enough, "Lobe de Beam."

After a pleasant lunch in the comfortable hotel dining room we settled down to the anticipation of ten days of pleasant hamming with our two calls, F8TH/LX/M and G3BID/LX/M.

The hotel had given me the same room as last year, and so that afternoon we set about erecting our first antenna for the fixed station.

We fixed the antenna which had worked so well last year, and although it was put up in the same place, it never gave us as excellent results as it had done the previous year. We were never able to find out why.

L or R: ON4JF/M, G3BID/M, XYL of F8TH, F8TH/M and LX1RK. All mobile except LX1RK, and all the mobiles members of Amateur Radio Mobile Society.

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We worked 5N2AAF, VK2AD, VK4HR and VK4KS on 20 meters, but somehow always felt that we were not doing as well as last year. It was on 15 meters that we really felt our performance was poor. We worked Walter (K1YZW). whom I work frequently from all sorts of locations, and he commented on the poor signal strength compared to other Europeans. Next day MP4TDA, whom I also know well, gave me 5 and 1 and also commented on the poor signal strength.

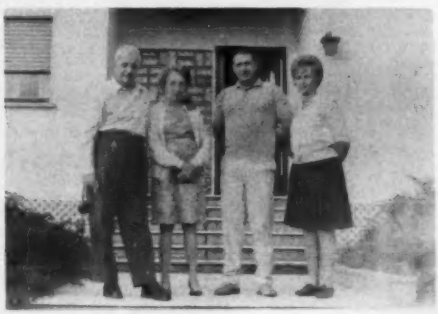
So, something had to be done about it, and Max and I put up a KW Trap Dipole in an inverted vee configuration. This was Max's idea; it worked splendidly, and reports were much better.

But it was the mobile operation which was most fun. We drove about the place in one car or the other, crossing the frontier into Germany and back on several occasions.

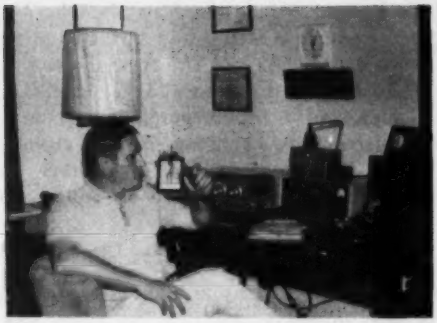
On one trip we worked W1BTU on both sides of the frontier, once as G3BID/LX/M and once as G3BID/DL/M, with only a short pause at the frontier where the German customs officer was very interested in operation and listened with interest.

Soon after entering Germany, we met Walter (K1YZW) again, and his report of our mobile signal was much better than from the fixed station earlier. We went on to Trier where we visited DL5SF whom both Max and I had contacted before, when Max was operating as G5AOV/M in England.

DL5SF, Bob Lefauconier, is a French officer serving in the French Army in Trier, and we had a very cordial reception at his apartment, and met his wife and children.



L to R: F8TH and XYL, DL4AP and XYL.



DL4AP at his station near Bitburg

Before leaving, we visited Hermann (DJ2BW), who was in the process of erecting a tower and a quad, and I do not think he could have been very pleased to have his work interrupted by our casual and unannounced visit, but he gave us a very warm and hospitaable reception.

On our return to Beaufort in the Grand Duchy of Luxembourg, we worked DL4AP on 20 meters and arranged to meet at the weekend.

Here I made a real fool of myself. I had worked him the year before, and also DL4EP, and had gone over to Bitburg Air Base where they were stationed. I had met Bob, DL4EP, last year, and his wife and children.

Now I got the two thoroughly mixed, and when DL4AP and his wife turned up on Saturday, I was surprised that I did not recognize him. However, I thought my memory for faces might be a bit weak. They arrived with a baby of about 4 months. I asked how the other two children were. Sid replied "This is our first one," pointing at the baby. Was my face red!

Then Sid solved the mystery. "You're thinking of Bob" he said, "DL4EP." In fact, I had never met DL4AP before! Sid is a grand guy and forgave me the stupid blunder.

Sid runs a Volkswagen Camper with a Swan 350 and Hustler antenna, and has been doing a lot of very good mobile DX recently. He has only been mobile a few months.

Later that afternoon ON4JF and his wife turned up, and then we had four nationalities all together – four different prefixes – DL4AP (American), ON4JF (Belgian), F8TH (French) and G3BID (British).

All four operate mobile, and all four are members of the Amateur Radio Mobile Society.

As mentioned earlier, I was in one of my blundering moods, and the next blunder was . . . I forgot to take a photograph of the four cars all equipped with mobile rigs.

Sid invited us over for dinner the following week. Then I committed the third blunder. I caught a cold and went to bed for a spell! Sid postponed the date, and though I wasn't okay to stay out for dinner, unfortunately, we went over for the afternoon and had a magnificent reception. They do not live on the base, but about 6 miles out, in a beautiful house right in the country with a wonderful view.

As a fixed station Sid runs a KWM2 and linear to a quad mounted on a tower, and what a signal he puts out.

Well, I had been frustrated in talking Max in to Beaufort because he had arrived before

DL4AP's QTH with his mobile camper Volkswagen with Swan 350. The quad can be seen on the tower on the left of the house.

me. But this time we really needed talking in. Sid's house is not easy to find; in fact, it is darned difficult to find.

Now I remembered that when Bob (DL4EP) had talked me in last year, he had mentioned where Sid's house was, but we had never seen it. Sid talked us in all right. Max drove my car while I operated.

Sid complained that my frequency was shifting. Not drifting – it always came back to the same spot – but didn't stay there. I had noticed this myself in reception. Naturally this was very worrying and, in fact, this worry was the only little disappointment in an excellent afternoon, where Sid's XYL gave us a lovely meal with a homemade cheese cake, which I will not forget in a hurry. Their home is fixed up beautifully with stereo tape recording and playing apparatus and every other modern convenience. Sid, by the way, is a veteran from Vietnam and so is his XYL. He was shot down in Vietnam and she nursed him back to health. That is where they met.

Well, to return to radio, I was sorry I had not brought the circuit diagram and the rig along, as Sid would have fixed it.

As a matter of fact, Max (F8TH) fixed it. We suspected all sorts of horrible problems. A zener diode regulator failure (that might have been difficult to cure; I had no spare zeners) – a vfo tube failure (that would have been easier, I had a spare), etc. It was so simple. The vfo tube was loose in the socket. I had carefully checked all the tubes, as I thought, but I missed this one! The manufacturer had thought of it and actually had spring clips to hold it in. But we had taken the rig in and out of the car every day and bumped it about the place a lot. And that was the only fault that developed. Naturally it was cured in a moment; we didn't even have to take the rig out of the case. The case has a lid which opens in just the right place.

We had a fine time mobiling, working a ot of French stations on 40 meters FØQH/M (mobile to mobile) on 20 meters both working on reciprocal licenses as he as DJ1GX when at home.

We worked WB2FNT, WB4KLM, WA3IWM, WB4FUT, and also ran into the Royal Signals net on 15 meters, working MP4TDE, MP4TDA, both in Sharjah, Trucial States, and 9M2DQ in Malaysia. The JAs were coming in well on 15 meters, and we worked JA1, JA3 and JA5 from the mobile on 15 meters, as well as VE6, TI2, and ZL1.

Max and I experimented with mutual interference by operating the two mobiles within a few yeards of each other on different bands, but caused each other no interference.

The hotel, by the way, had two separate television sets in different places, both in color, and a whole battery of antennas pointing in all directions to receive French and German television programs, as well as Luxembourg and Belgian programs. Only once did we cause any interference, and then we had mistuned something – otherwise we operated right through TV hours with no trouble.

Max is a tower of strength, helping me erect the antennas, or should I say erecting the antennas while I watched. Max is ex-French Navy and does everything neatly, tidily and efficiently, which is a good antidote for anyone as untidy as I.

Anno 1158 proclaims the notice in Beaufort Castle. The visitors are F8TH/M holding "Lobe de Beam," G3GID/M and ON4JF/M. All are members of Amateur Radio Mobile Society (except the dog!).

His XYL put up with an awful lot of amateur radio, and made it a most enjoyable party, as we did not concentrate too much on radio, but did a lot of sightseeing, including Vianden and Beaufort Castles and the Monastery at Clairveaux. And the dog "Lobe de Beam" kept us thoroughly amused.

We had another international party when I spotted a car with DL5UH on it. This turned out to be the old DL4UH (W6ECS) who had been the first arrival at the Verviers Rally in 1963 when we got our first reciprocal licenses. This time five nationalities gathered:

DL5UH (W6ECS) American; ON4JF Belgian; F8TH French; G3BID British; and LX1RK Luxembourg jointed the party, too.

All except LX1RK are mobile operators and, except LX1RK, all are members of the Amateur Radio Mobile Society.

This time I remembered my camera and took a photograph of the international gathering.

The end of the trip was approaching, unfortunately, and I had to say goodbye to Max and his XYL and "Lobe de Beam," who set off in their car for Paris, but not before Max had taken the first antenna down for me.

I stayed on a few more days and before returning home went on a shopping expedition to Bastogne to buy some *Pate de Sanglier* or *Pate of Wild Boar* or Wild Boar sausage, if I couldn't get the *Pate*.

The road rises to high ground at Heiderscheid, west of Ettelbruck before dropping into a deep gorge along the Valley of Sure.

At Heiderschied I contacted VE3CLO on 15 meters in a 3-way, and he gave me 5 and 6. I lost him in the deep gorge, but he carried on with the other station until I got out of the gorge and we continued the QSO to the frontier with Belgium. Here, I warned him to expect a change of call sign as I crossed from Luxembourg to Belgium, and I came up again as ON8ID/M on the Belgiam side, and as I got to Bastogne he gave me 5 and 9. So the rarer call of LX is not always worth a couple of S units!

Don (VE3CLO) proposes to put a mobile rig in a fiber-glass bodied car. I am most anxious to know how he gets on. It may well be difficult. But I hope he lets me know.

I repeated this journey next day to pick up the *Pate* they had kept in the fridge for me, on my way home via Brussels to London, so I thought I would try this for another nice long QSO while I drove from Heiderscheid (near Ettelbruck) to Bastogne.

15 meters didn't sound so good, so I switched to 20 meters and found GM5NW in Dundee and worked him right through the gorge to Bastogne. Again, of course, the change of call sign as I crossed the frontier, which always gives the other station some pleasure. I dropped from 5 and 6 at Heiderscheid to 5 and 3 at the bottom of the gorge, but was up to 5 and 7 at Bastogne.

I only signed with Ernie at Bastogne to park the car and collect my *Pate* of Wild Boar. I soon found him on the frequency as I called QRZ on leaving Bastogne for Brussels. I was soon joined by G3ASC in Oswestry and worked him all the way to Marche-en-Famenne, when I was called by DL9RC.

By the way, the roads here are really excellent. The new road from Bastogne through Marche to Namur is almost complete except for about 10 miles, and it is really good, and no longer goes through Marche but bypasses the town.

I had an appointment with ON4JF in Brussels, and here the talk-in again was really necessary and worked excellently. We had made a sked on 40 meters – we found each other at once, and I was guided right to his house. I spent a delightful couple of hours with him and then off on the Autoroute to Ostend. Armand kindly guided me in his car until I was on the right road.

From Ostend I made another few QSOs before closing down with the ON call and returning to Britain by the very comfortable, quick and efficient air ferry which flies you and your car from Ostend to Southend in England in 45 minutes. I was clear of Customs eight minutes after touchdown and driving off towards London.

The last three QSOs on this trip from Belgium were on 15 meters with WA9PFC, near Chicago; ZS1CS and G3AS. But G3AS was really too close and skip was wrong. He gave me 5 and 2 only.

. . .G3BID

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50 MEGAHERTZ DX

After I worked some fine DX on six this summer, I have come up with some conclusions to pass along to other VHF devotees:

It would appear that the band is open more than most of us suspect. The problem is that there is nobody around working the openings. Of course, there are lots of people *listening* – it's just that they are all sitting in the shack minding their own business without even knowing about the opening. Since most openings come to light when you hear some exotic contact making some noise, take advantage of the situation and make some noise yourself – so the other fellow can hear you.

The easiest way is to engage in a local QSO, but orient your antennas in various directions. Now and then I'll talk with a fellow eight miles away. Aligning the antenna on a precise aximuth for such a distance is not necessary (the signals are so good that they come in on the noise blanker), so one of us aligns the antenna northeast; the other southeast. We cashed in on this with a breaker from Albuquerque.

There is no need to run out of things to talk about, unless you are particularly boring yourself. Talk about anything – the weather (yesterday, today, tomorrow); articles in the current issue of *73* (if he doesn't have it, you can read the article to him); discuss paragraphs from the FCC Manual (it is surprising the number of people who have forgotten some of the rules, or at least don't use them consistently); practice code, or anything else. We had a 3-way round table that had a break-in from Colorado in this manner. When the other guy hears you, he will come in.

It's a good idea to use your VOX instead of PTT, since you can hear the breaker and not ramble on for another five minutes or so and miss the DX because of changing conditions.

Nobody to talk to? Then make a lot of noise every ten minutes or so. A CQ only takes one line in the log, and you might turn up something fascinating. A fellow from Texas heard my CQ one morning – neither of us had any idea the band was open.

The call CQ DX is silly. If any DX stations hear, you can be sure they will answer; they are as anxious to work double-hop as you are. Most of these calls end up with a local contact anyway, so we are back making noise, which will be picked up on an opening.

Be a gentleman when the band is open. It is amazing how many nice guys turn into fiends with sharpened teeth when the band opens.

1. Don't tune your transmitter on the working frequency. Move up a way; things won't change that much, and the rest of us won't have to work through the carrier.
2. Don't send on top of someone except to give your call. One fellow was calling CQ in CW on top of a DX QSO, making it impossible to hear the stations' IDs.
3. Wait your turn in a pileup. If someone else is transmitting, bite your fingernails until he's through.
4. Don't ragchew in a pileup. Others are waiting. Remember the Golden Rule. Ragchew when it is apparent everybody around has checked in and you have a roundtable going.

My first Ohio contact was marred by somebody hollering *INTERFERENCE INTERFERENCE INTERFERENCE . . .* " all the way through the 4-minute QSO. If this guy has a gripe, let him get on the air and tell me – I'll apologize. Meanwhile, like the rest of us, such a person should simply wait his turn, then give the desired station a call.

These suggestions have been successful in detecting elusive 6-meter openings. Let's not sit around listening – let's make some noise to let the DX know we're around.

. . .WA6CPP

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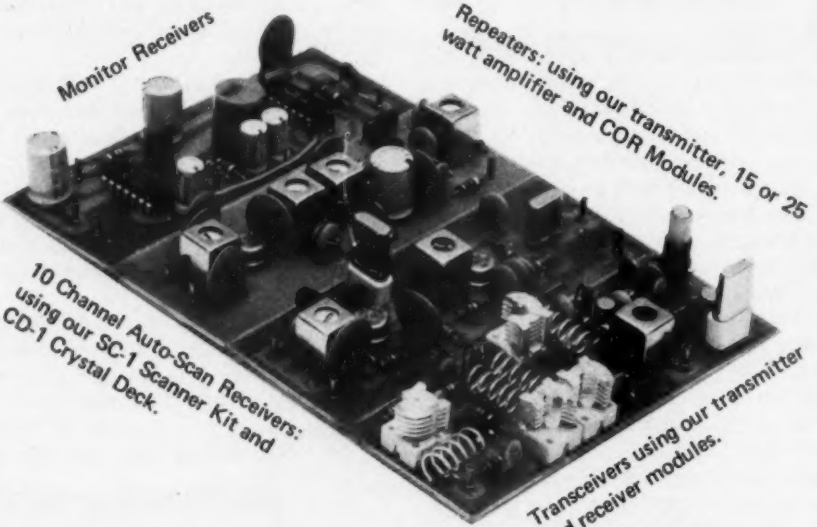
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Questions Questions Questions

I use a Globe Scout 680 transmitter in the 40-meter Novice band. All but one of my seven crystals have bad keying chirps; therefore I am limited to one frequency. I would buy more crystals if that would solve the problem, but one out of seven is not good odds. What do you suggest? Possibly one of the crystal manufacturers might be willing to inspect your non-chirper and attempt to grind you other crystals with the same characteristics. But such custom crystals would probably be quite costly. A more promising approach is to modify the transmitter slightly for improved keying. The following suggestions apply to any cathode-keyed CW transmitter:

Temporarily disconnect the oscillator cathode circuit from the key jack and ground the lead. You now have straight amplifier keying. If this does not cure the chirp, try regulating the oscillator screen voltage by cutting in half the resistance of the screen dropping resistor and connecting a 150V voltage regulator (OA2) between the resistor and ground. Also regulating the oscillator plate voltage is desirable.

Once the amplifier can be keyed without chirp, transfer the chassis end of the oscillator grid resistor to the cathode terminal of the oscillator tube socket. Next insert a 50Ω, 10W resistor between the ungrounded terminal of the key jack and the rest of the keying circuit. Finally, connect a 10 μF, 450V capacitor from the cathode side of the resistor and the transmitter chassis.

When the key is first closed, both the oscillator and the amplifier immediately turn on. When the key is opened, the amplifier immediately turns off, but the oscillator hangs on until the added capacitor charges through the tubes sufficiently to turn it off. At normal keying speeds, the oscillator will continue to function during the spaces between dots and dashes in a letter, but it will drop out during longer pauses. The result is chirpless amplifier keying combined with automatic oscillator shutoff during keying pauses. The length of time that the oscillator stays on after the key is released depends upon capacitance of the added capacitor in the cathode circuit. The 10 μF specified is a good compromise value for most operators.

The nearest water pipe to my radio room is far across the house. Another amateur told me that a 2-ft long, concrete-reinforcing rod stuck in the ground was all the protection I needed against lightning. But I still feel nervous depending on that 2-ft piece of metal sticking out of the ground to protect my equipment and me against lightning. Should I be? I would be nervous, too! The National Fire Code specifies that, to be a

suitable protective ground electrode, a water pipe should be buried in the earth at least 10 ft deep. It follows logically that a driven ground rod should penetrate the earth to the same approximate depth. A ¾-in. water pipe or a 5/8-in. solid rod is suitable. Drive it into the ground where the shortest direct connection between it and the lightning switch or arrestor installed at the point where the antenna enters the house can be installed. The fire code suggests a No. 4 or larger ground conductor for transmitting antennas and a No. 10 or larger conductor for receiving antennas.

On 80 and 40 meters, there are images every 16 or 17 kHz across the dial of my SX-101A receiver. How can I get rid of them? These spurious signals are easier to identify than to eliminate. They are undoubtedly harmonics of the 15.75 kHz horizontal sweep signals of nearby television receivers. Try turning off all the nearby TV receivers that their owners will let you touch to see if the interference disappears. If you discover the culprits (there may be several of them in an apartment house), check with the sellers or manufacturers. The problem is not unknown to television receiver manufacturers, and their service departments can often supply suggestions and components for use by television servicemen in reducing the spurious radiations to FCC standards. The radiations may come from the TV receiver antenna, or its power line, or directly from components on the chassis. Improved shielding and lead dress, and better filtering of power leads are standard remedies.

At your receiver, the spurious signals could be getting in via the power line or by

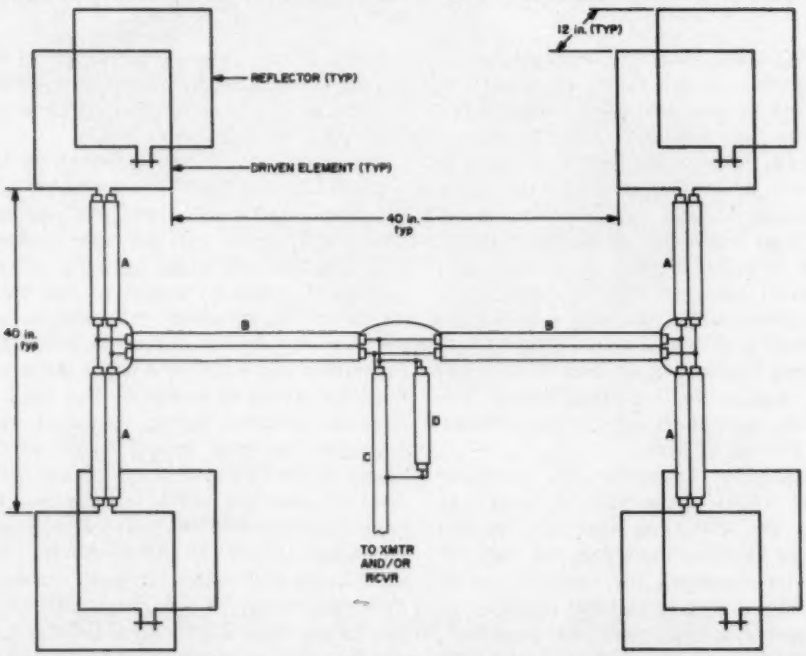

Fig. 1. Note: Solder all adjacent coaxial cable shields together, except top of feedline (D) and top of balun (C). Data on phasing harness — Frequency: 144.5 MHz. Decrease suggested lengths ¼ in. for each 1 MHz increase in frequency. A — 4 pair 75Ω, solid polyethylene insulated coaxial cable 41-5/16 in. long (¾ wavelengths). RG-11A preferred. RG-59A usable. B — 4 pair 75Ω, solid polyethylene insulated coaxial cable 53-13/16 in. long (one wavelength). RG-11A preferred, RG-59A usable. C — 75Ω coaxial transmission line. D — 19-¼ in. length (¼ wavelength) of same type of coaxial cable used for main transmission line. Inner and outer conductors shorted together. Use epoxy of similar low-loss cement to waterproof connections. Radiator and reflector loops 20 in. per side, 8 in. tuning stubs in bottom sides of reflectors.

direct pickup, but the most likely path is the antenna. The latter possibility is easily tested. A horizontal receiving antenna fed with coaxial cable and located as high and far away as possible from the source of interference is usually less susceptible to TV birdies than end-fed wires and most verticals, simply because the latter two are usually close to the source of the interference.

How can I use coaxial cable in place of 300Ω TV ribbon in the phasing harness of the 144-MHz, 4-bay quad antenna described in the 1971 ARRL Handbook without unbalancing the system? I am sure that a coaxial harness would be more stable in wet weather than the 300Ω ribbon is. The coaxial phasing harness is sketched in Fig. 1. Basically, each length of 300Ω line in the original harness is replaced by two lengths of 75Ω coaxial lines beside each other. Their shields are connected together at each end, and their center conductors are connected into the system just like the corresponding conductors of the 300Ω line. Because standard polyethylene-insulated coaxial cable has a velocity of propagation (VP) of .66, compared to a VP of .82 for the 300Ω ribbon, the lengths in the new harness are approximately 20% shorter than in the old one. Also, a 1:1 balun, instead of a 4:1 balun, is used where the main transmission line is connected to the center of the phasing harness. The phasing harness can be constructed of either RG-59A or RG-11A cable – the former being easier to work with and the latter giving slightly lower losses. In either event, RG-11A is strongly recommended over RG-59A for the main feedline, unless the line is very short. Note that the element spacings in the individual 2-element quads in the original ARRL design were apparently chosen to produce a 75Ω feedpoint impedance. If the individual quads were of the 3-element type, the feedpoint impedance would probably be closer to 50Ω than to 75Ω; in which event 52Ω coaxial cable throughout the system is recommended.

Keep your questions short and address them to: *Questions, 73 Magazine, Peterborough NH 03458.*

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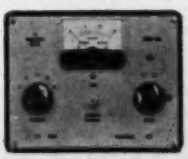

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Let me illustrate the problem. The horizontal sweep is set at 100 μs/div. and ¾ of a pulse is displayed. In order to see the complete pulse you must change the sweep speed and the nearest slower speed is 1 ms/div. In addition to the complete pulse you will also see 6½ more pulses of the pulse train as well. The resolution has been lost. You could use the variable sweep control but then the calibration would be useless for any accurate time measurements. What is needed is a calibrated sweep of 200 μs/div. A similar situation arises when three pulses are displayed at 100 μs/div. and you want to get maximum detail of one pulse. You need a sweep speed of 50 μs/div but you only have a sweep speed of 10 μs/div which would display only 3/10 of the pulse.

Adding ten more calibrated sweep speeds may sound like a formidable undertaking but really all you need is one more 10 KΩ 1% resistor and a two pole three position switch!

Basic Design

Let us look at the basic sweep circuit in Fig. 1 (the designations are Heathkit's). It is a PNP transistor using a basic characteristic

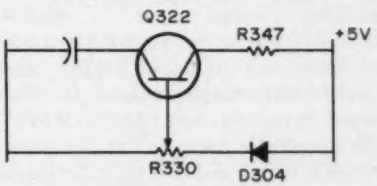

Fig. 1. Basic Sweep Circuit.

of a transistor. The collector current is nearly equal to and controlled by the emitter current. The voltage on the base of the transistor is held constant by the bias resistor R330. This will cause Q322 to conduct until the voltage across R347 is equal to the voltage across the bias resistor from its wiper tap to the cathode of D304

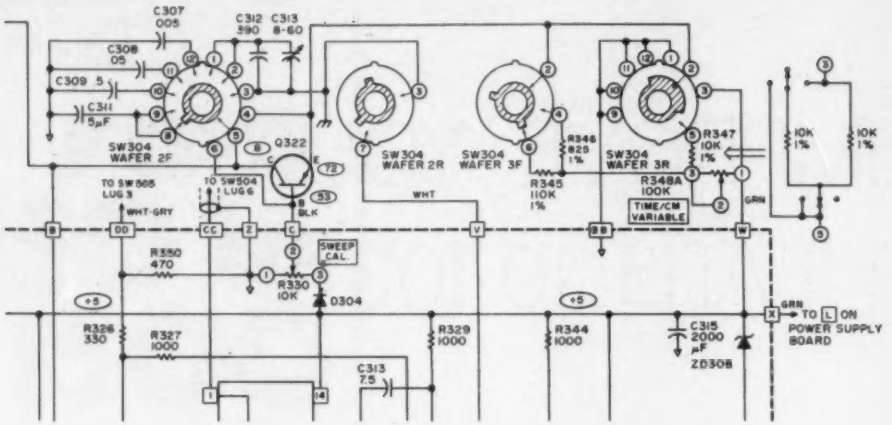

Fig. 3

(the diode mirrors the base-emitter voltage for temperature stability). By ohm's law, if this voltage is held constant and the resistance of R347 is held constant, then the emitter current must be constant. It follows then that the collector current will be constant as well and can be used to create a linear sweep voltage.

Let us look at the capacitor charging formula. I/C = change of volts/time. The change of volts/time is our linear sweep. The capacitance will stay constant so the charging current is the only parameter to change to give us a new sweep speed. Going back to our discussion of the basic sweep circuit we see that R347 controls the charging current. Thus to double the charging current and thus the sweep speed we must *halve* the value of R347. Similarly, to halve the charging current and thus the sweep speed we must double R347. With this knowledge we take our two pole three position switch and two 10 KΩ resistors and combine them to make a new R347.

Heathkit has used 10 KΩ for all but two of the sweep currents, changing decade ranges by changing the sweep capacitor. For the desired sweep speeds we will need an R347 of 5 KΩ 10 KΩ and 20 KΩ. The 5 KΩ can be fabricated by paralleling the 10 KΩ resistors, the 10 KΩ resistor is supplied, and 20 KΩ can be fabricated with two 10 KΩ resistors in series. This sounds like five precision resistors but a switch is necessary regardless so it can be used to make up the various values. Now only one more precision resistor must be acquired. The resistors and switch wired as in Fig. 2 will replace the original R347 in the sweep circuit.

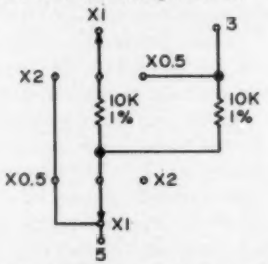

Fig. 2. Modified circuit to replace the R347 in the sweep circuit in Fig. 1.

In use the original decade selector chooses the correct capacitor for the desired decade, then the new switch will choose the multiplier which will give the sweep X1, X2, or X0.5.

When buying your switch be certain to get one small enough to fit in the available panel space beside the decade switch. As a small finishing touch, spend the few extra cents to buy the Heathkit H2 pointer knob and its insert. The result will be an I0-103 which appears at first glance to be unmodified but which holds the advantage of ten more calibrated sweep speeds.

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How many times have you decided to build a circuit from a magazine only to find you either didn't have the correct parts, or the parts were too expensive, or not available in your area? Or your possible substitutions weren't close enough in value to be usable? Or how about the authors who neglect to tell you that the circuit requires a special piece of test equipment owned by only five or six companies in the world?

Really disgusting, isn't it? I know. I personally have a rather large box of assort-

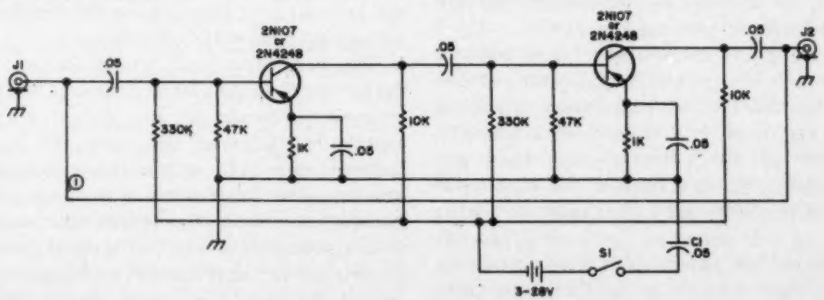

Fig. 1. Schematic diagram of the mono-reproducer.

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ed partially completed projects which need only a part or two to finish. Of course, there are some I completed, but the results weren't as I expected.

But now, back to this exceptional circuit. Construction details have been left up to the individual's own choice. Your case may be precision built made out of special alloys or may be just a cardboard box.

Don't worry about little things like component tolerances. Parts may vary by as much as several hundred percent and the circuit will still perform adequately.

You've just checked and found out you only have one good NPN transistor and one old shorted PNP on hand. Okay, go ahead and use them both. They'll work all right. Matter of fact, if you don't have any transistors, it's still okay as the circuit will still accomplish the same result, i.e., what goes in will come out unchanged and unmodified. An added bonus is the extremely low power drain from the battery (battery may be expected to last for its normal shelf life).

How have we accomplished all this? Well, that gets down to the secret of the circuit. Notice the careful placement of capacitor C_1. Make sure this part is not shorted (however, the other capacitors in the circuit may be shorted). Its placement insures long battery life.

Now notice the large (1) next to the input jack J_1. This is the feedback lead from output to input and is really the most important connection for the success of the circuit. The size of this wire should be as large as possible. (Notice how no electronic components have been used in this feedback path to interfere with performance.)

The next time your homebrew project doesn't work as the author claimed it would, remember this circuit and give it a try. You'll be glad you did; you will have restored your faith in homebrew projects. Imagine your pride when you show your friends your mono-reproducer and watch their amazement as you put a signal in and actually get the same one out unchanged and unmodified with no power having been consumed.

. . . K9VXL

Charles O'Hare WA8DEB
Box 161
Carroll OH 43112

Low Power 6 Meter AM Transmitter

This article is for the low power enthusiast and describes a 6-meter AM low power transmitter running about 90 mW output.

The OX oscillator produced by the International Crystal Co. is used as the oscillator stage. The output from the oscillator is applied to a transistor amplifier, increasing the output to about 90 mW. As can be seen in Fig. 1, the transistor amplifier is of straightforward design and there should be little difficulty in duplicating it. However, when testing the transmitter, a milliammmeter should be placed in the collector battery lead of the amplifier, to monitor collector current. Should the collector current exceed about 20 mA or continue to rise above that value, remove power immediately to prevent transistor damage and check base-emitter connections. I mounted my rf amplifier on a homebrew printed circuit board having the same dimensions as the OX oscillator. The modulator employed in my transmitter is described in the ARRL VHF Handbook, page 151 of the First Edition. A conflict of voltage polarity existed between the transmitter and the modulator and individual batteries were used for each.

Tuneup

Tuneup is accomplished by attaching a 6-meter antenna to the transmitter. A length of wire is attached to the antenna jack of a 6-meter receiver. This wire should be long enough to give an indication on the receiver's S-meter with the transmitter turned on. L1 is adjusted for maximum S-meter reading on the receiver. Set the audio gain control on the modulator for the desired audio as monitored on the receiver. With the tuneup complete the rig is ready to go on the air.

The QRP rig was put on the air upon completion and replies were received to my first several CQs. The greatest distance worked thus far has been approximately 40

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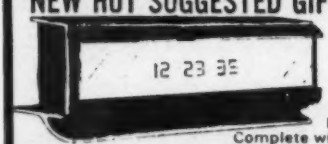

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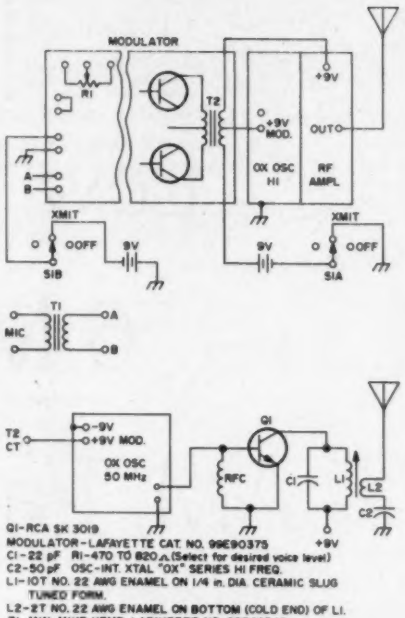


Fig. 1. Modulator – Lafayette Cat. No. 99E90375. Parts: Q1: RCA SK3019; C1: 22 pF; C2: 50 pF; RFC: Z-50; L1: 10T No. 22 enamel on ¼ in. iron core, ceramic slug tuned. L2: 2T No. 22 enamel on bottom L1; T1: miniature microphone transformer (Lafayette 99E60345); T2: miniature modulation transformer (Lafayette type AR162); S1: 2P3T; OSC: International Crystal OX osc. Series HI freq.; R1: 470–820Ω. Select value for desired voice level.

miles with an S-9 signal. The QTH is located in a poor VHF location so the results are more than satisfactory. The transmitter has not been on the air during skip conditions, so we are waiting for an opportunity to give it a try. This transmitter is on the air nightly and local contacts are routine. Remember, when using QRP power the choice of frequency and the band activity is important in making contacts. We have been very successful in making contacts when the band is quiet or when very few stations were on. We have had our greatest success later in the evening. If your interest is low power, give this little rig a try. The cost is small, and the results are exciting. Good luck in your QRPing.

. . .WA8DEB

John J. Schultz W2EEY/1
c/o RLC Inc.
30 East 42nd St.
New York NY 10017

Inexpensive RF Speech Clipper

Rf level speech clipping for SSB transmitters, where the SSB signal is clipped and then refiltered to remove distortion products, is generally conceded to be the most effective type of speech processing that can be applied to a SSB transmitter. This system is employed in the more expensive amateur equipment designs as well as in many military and commercial SSB designs instead of simpler audio compressor or alc circuits. Material has been written before on the building of such clippers as accessory item or modifying existing transmitters for rf speech clipping. The main drawback to such designs, particularly those intended as independent accessory items to a transmitter, has been the expense involved because of the need to use two sideband filters of either the crystal or mechanical type. The cost of the necessary filters alone could run to $70 or more if new filters were purchased.

This article presents an rf speech clipping unit which can function as a completely separate accessory item for use with any SSB, AM or FM transmitter, has 99% of the performance capability of the more expensive designs but yet can be built for a total cost of $20 – 30 including the necessary filters. One can also still use an available speech compressor as part of the unit if such a unit is available and one now wants to upgrade the speech processing used to include rf speech clipping.

Basic Unit

The basic functions of the rf speech clipping accessory unit are shown in block diagram form in Fig. 1. It consists of a basic SSB generator as would be found in any SSB transmitter. The SSB signal is formed by the sideband filter following the balanced modulator. The signal is then amplified, clipped, and again amplified. A second sideband filter is then used to pass only the original sideband signal and remove the spurious signals generated during the clipping process. The filtered signal is then demodulated by a simple ring diode demodulator and is audio fed into the microphone input of any transmitter.

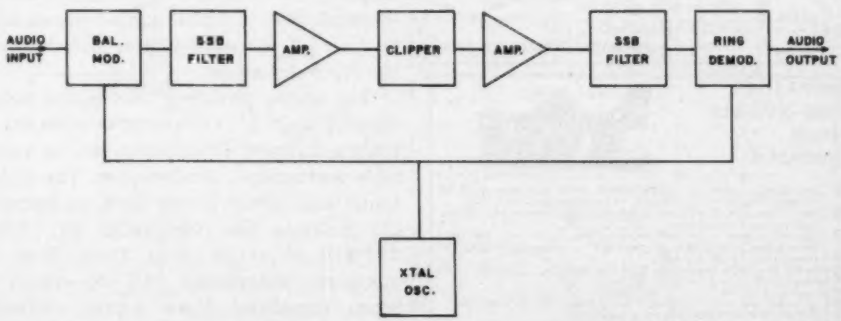
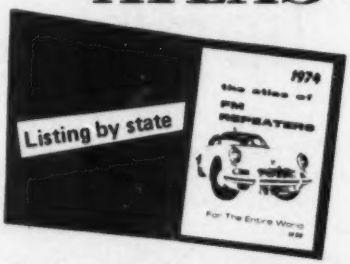


Fig. 1. Block circuit diagram of rf clipper unit. Use of various modules and diode array packages considerably simplifies construction.

1974 WORLD repeater ATLAS



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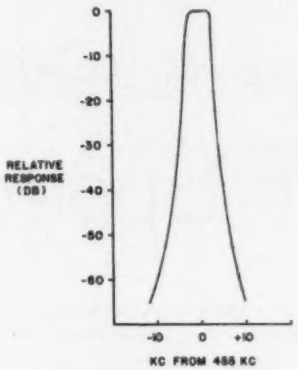

Fig. 2. Response of Amperex 2422 540 50021 crystal filter. Response is not perfectly symmetrical, especially at high attenuations.

The system works effectively because clipping of the SSB signal at an rf level produces far less distortion products than if the audio signal were directly clipped. A hard clipped audio signal cannot, in fact, be fed into an SSB transmitter because the transmitter cannot reproduce the square wave form of a hard clipped audio signal. In-band audio distortion products are still present with the rf speech clipper system but remain at a reasonable level, at least for speech transmission.

Various shortcuts have been tried to get away from the double sideband filter requirement shown in Fig. 1, but without any great success. A second sideband filter is absolutely necessary or the demodulated audio signal will be greatly distorted. The use of one "good" sideband filter and a broader, less expensive type for the second sideband filter or just a simple low-pass filter in place of the second filter also produces too much distortion.

The secret, obviously, to building such a clipping unit at a reasonable cost lies in finding sideband filters which deliver acceptable performance at a low price. The author found such filters in the form of Amperex (35 Hoffman Ave., Hauppauge NY 11787) 455 kHz i-f crystal filters. These filters are miniature, inexpensive ($5 –6) crystal i-f filters employing three crystal elements, input and output transformer coupling, etc. The internal circuitry is not so important, however, as to look at the selectivity charac-

teristic of these filters, as shown in Fig. 2. The filter has practically no ripple in its passband and reasonably good skirts, although the attenuation characteristic is not symmetrical at very high attenuation values. The bandwidth, if the carrier oscillator is set at the usual – 20 dB point on one side of the filter response, is about 6 kHz. Such a filter used alone as the sideband filter in a transmitter would not be suitable because of its bandwidth and lack of steep skirts. However, for use in an rf speech clipper accessory where the sideband signal is again demodulated to audio in a closed system, the filter's characteristics are adequate. The filters are relatively new on the market and if they are not available locally, one should inquire directly of the manufacturer for distributor information. The manufacturer may even be inclined to assist in obtaining the filters at reduced cost if one indicates that they are being used for amateur radio purposes in circuits which utilize the filters' unique characteristics. The filters are the "sharpest" ones which the manufacturer currently produces and are rated as nominal 4 kHz bandwidth units designed for narrow band AM reception.

Practical Circuitry

Besides the use of the filters just described, the practical circuit of the rf clipper unit makes use of another inexpensive item commercially available from any major mail order house. This item is the Miller 8902-B i-f amplifier module which also sells for about $5. With the use of this item, the relatively complex looking block functions of Fig. 1 reduce to basically a simple interconnection of various modules as shown in Fig. 3. The diode balanced modulator can either be separate diodes (IN63 or similar) or a diode array such as the RCA CA-3019. This array provides sufficient matched diodes for both the balanced modulator as well as for the rf clipper diodes at a low total cost. It has the advantage of providing somewhat better modulator performance than separate diodes because each of the diodes in the CA-3019 are inherently matched. The carrier oscillator is a simple conventional circuit where the collector output circuit is broadly resonated by the tank circuit consisting of the 220 μH choke and 630 pF capacitor. The circuit will work well with any standard 32 pF crystal and this fact plus the relatively soft skirts of the sideband

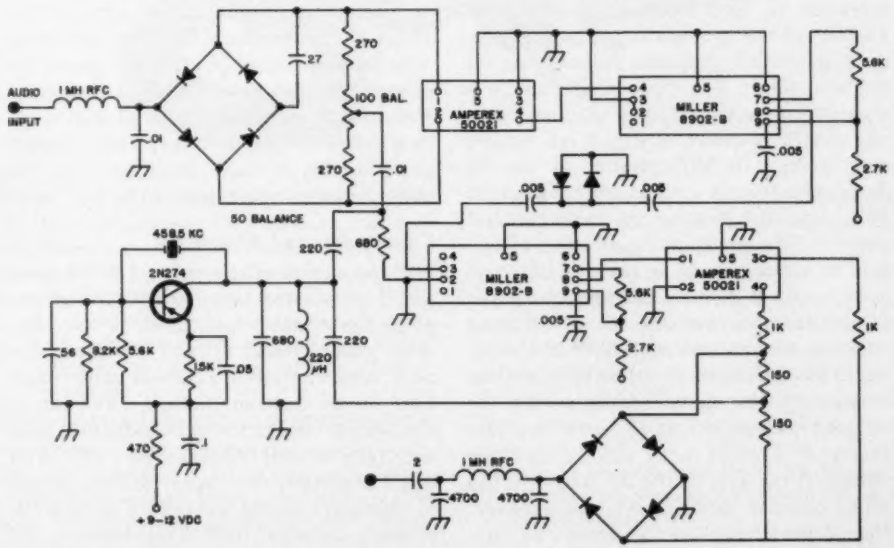

Fig. 3. Wiring requires little circuit construction; mostly just interconnection between i-f modules and filters. Separate diodes such as IN64 or IN914 can be used but use of RCA diode array CA 3019 containing six matched diodes on one chip is recommended for the balanced modulator.

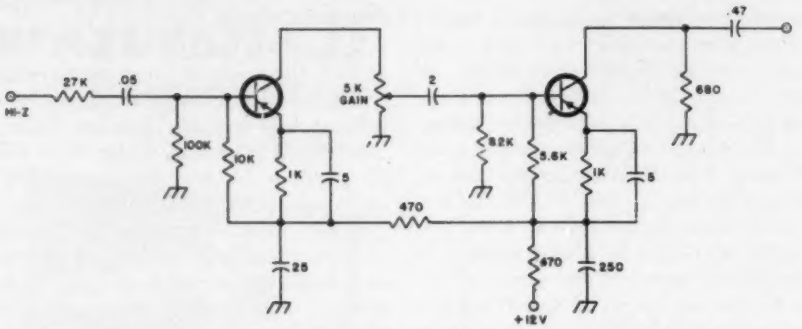

Fig. 4. Audio preamplifier for HI-2 mike having shaped communications response. Transistors are 2N466 of HEP254.

filter eliminate the need for any frequency adjustment circuit for exact oscillator output frequency.

The audio input to the balanced modulator can be supplied from the output of an existing speech compressor. Most compressors will have more than sufficient output level to drive the balanced modulator. In case one doesn't want to use this approach, a simple separate audio amplifier can be built as shown in Fig. 4. Also, any one of the great number of microphone preamplifiers available on the market in kit or module form can be used to drive the modulator. The rest of the circuitry is just the interconnection of the i-f amplifier modules and the sideband filters. The diode clipper circuit is placed between the amplifier modules. Separate diodes as shown in Fig. 3 can be used but, again, it is advantageous to use the diodes available on a diode array such as the RCA CA-3019 because of their matched qualities. The emitter-base junction of certain transistors, such as the 2N3702, also make excellent diodes for clipping purposes. The product detector for the final SSB signal after the second sideband filter is a diode ring demodulator, the injection voltage being supplied by the carrier oscillator for the balanced modulator. Again, either separate diodes or a diode array can be used, although in the case of the demodulator, the use of matched diodes is rather unnecessary. The slight distortion produced by unmatched diodes, considering the overall distortion products in the rest of the system is insignificant.

In Fig. 3, connections are shown being made to a pin 8 on the i-f amplifier modules. The modules as purchased do have a pin 8 but it is not connected internally. A very slight bridging connection must be made internally in each module as shown in Fig. 5. If one carefully examines the underside of the module wiring, which can be easily exposed by lifting the cover via bending of the cover tabs, a solder line will be found to go by pin 8. This solder line connects the "hot" side of the link output on the last i-f transformer within the module to the built-in AM detector diode in the module. The solder line can be easily found by also seeing how the diode is wired in on the top of the module board. A circuit diagram is supplied with each module and tracing of the circuitry is relatively simple. In any case, a simple solder bridge is made from pin 8 to the above described solder line.

Construction and Adjustment

Construction of the unit can be made on simple perforated board stock. The photograph shows my construction. In this case, three small (about 4" x 2") boards were used. One contained a speech compressor. That shown contains the balanced modulator, carrier oscillator, first sideband filter and first i-f amplifier module. The third board contained the clipper diodes, second i-f amplifier, second sideband filter and the product detector (ring demodulator). All three boards should be contained in a small metal enclosure. There is no particular layout of parts required, except to keep the

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various rf leads as short as possible. Be sure that the filter cases are grounded (center solder pin) and that the i-f amplifier module cases are grounded (solder to one of the case tabs). A somewhat awkward arrangement of trimmer capacitor is shown in the photograph. Two 25 pF trimmers were connected in parallel to duplicate the single 50 pF unit shown in the schematic for the balanced modulator capacitive balance. Two other trimmers were used in the crystal oscillator circuit which proved completely unnecessary and are not shown in the schematic.

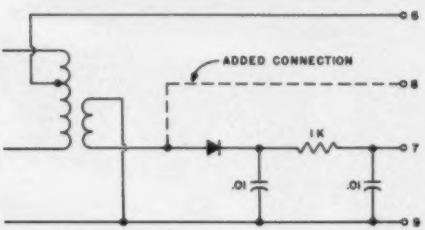

Fig. 5. Minor modification is necessary to Miller 8902-B i-f module as shown. Pin 8 is normally not used.

A HC-16/V type crystal is shown but this type of crystal cut to the carrier frequency required is expensive. An FT253 holder crystal will function just as well, of course, and a particularly good value can be found in this type of crystal from JAN Crystals. They will supply such a crystal cut to any frequency desired in the 350 – 500 kHz range for just $1.75 plus postage. This larger crystal holder can be soldered directly on the perforated board without any need for the crystal holder.

Adjustment of the unit is quite simple since only the carrier balance controls (resistive and capacitive) require adjustment. The easiest way to accomplish the adjustment is to listen to the SSB signal on a receiver before the clipper diodes. Without any audio input, the 100 Ω carrier balance potentiometer and 50 pF balance control are successively adjusted for minimum carrier level. If available, a sensitive voltmeter with rf probe can also be used to make the adjustment. An audio test input is then applied and the SSB signal before clipping checked for clarity. The signal then can be checked after the product detector by feeding it through any available audio amplifier system. The clipping circuit should not normally require any adjustment. If the clipping, however, sounds too harsh or distorted, a 10K potentiometer can be added before the clipping diodes to regulate the signal level feed to the diodes to a value which provides the best sounding final audio. The i-f amplifier modules as well as the sideband filters have screwdriver adjustments on top for the i-f transformer which are a part of each unit. These transformers should not require adjustment unless somehow their factory adjustment was changed. If one trys to touch up these adjustments, do so for maximum signal level output from the product detector while listening that the final audio output does not become distorted. Rather than using an audio signal generator, the audio output from a small radio tuned to a local broadcast station makes a good audio test signal source.

Summary

The rf speech clipper described can be constructed relatively inexpensively and will provide very good results. It is difficult to assign a definite dB value to the improvement in transmission capability that an rf clipper provides. Numerous tests have shown that such a speech processing method is superior to other forms. The unit described was tried, using the same equipment setup, against equivalent types of processors using more elaborate components and techniques. Under difficult QRM conditions, it provided as much an apparent signal intelligibility increase as any other unit. When signal levels improved, its distortion became apparent sooner than that of units employing, for example, two mechanical filters for sideband filtering. Distortion in this case means only distortion within the passband of the transmitter being used and not a broadened signal. Therefore, used when appropriate under difficult conditions, the clipper did prove to be one of the most useful accessory items that one could devise for use with a transmitter versus dB's gain per dollar of expenditure.

...W2EEY

Ann Lemert
2224 Sandra Court
Lexington KY 40504

PROFESSOR BEAMS SPECIAL LECTURE TO CLASS

When Durward Olds bought his first radio kit, he intended to build the combination shortwave and standard broadcast set only as a sort of test run. If the set worked, he planned to get another for his 12-year-old son to build.

The set worked. And just last winter, Doc Olds WB4GNL conducted what may be the first classroom lecture delivered by ham radio. Dr. Olds is professor of animal science at the University of Kentucky in Lexington.

The lecture was given at the invitation of Arlo F. Shelley K7KNQ, biology and physics instructor in the little town of American Fork, Utah. Dr. Olds accidentally contacted Shelley one week end, and before their visit ended, found himself scheduled as "guest lecturer" the following week for Shelley's high school biology class.

"I wasn't sure at first he was serious about the invitation," Doc recalls. "Moving radio equipment and antennas to the school would be a real chore."

The lecture, "Reproduction and Artificial Insemination of Farm Animals," was broadcast from Dr. Olds' wood-panelled ham shack in the basement of his home. Written especially for this class, the 50-minute talk included some material Dr. Olds has used when addressing university freshman classes.

Shelley relayed questions from the class at ten minute identification intervals, and again at the conclusion of the lecture.

"I was quite impressed by the questions these students asked," commented Dr. Olds.

Besides the students, the audience in Utah included the school principal, a newspaper reporter and a professor from Brigham Young University.

Five years ago, Dr. Olds asked a colleague in the dairy science department at the university to recommend a Christmas gift, "... something electronic," for his son to build. The friend, Wally King WA4NNZ, suggested a radio. Dr. Olds chose a $40 combination shortwave and standard broadcast kit from a catalog.

"I was delighted when it worked!" he recalls. "For about a year, I listened to ham broadcasts, whetting my enthusiasm."

"Prodded by his friend, Doc got his license in 1967. He earned the General license in 1968 and moved up to Advanced status in 1970.

Doc WB4GNL of Lexington, Kentucky, in his shack. (Photo by Ab Lemert.)

That first set led to others, including a transceiver he built for a former student (Oliver TI3OD) who moved to Costa Rica three years ago and teaches animal breeding there. They have maintained a weekly schedule since.

Dr. Olds' son may have inspired that original radio kit purchase, but it was the father who has been hooked by a hobby he finds both stimulating and relaxing.

...Lemert

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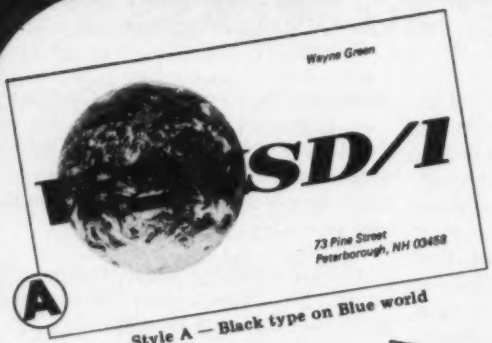

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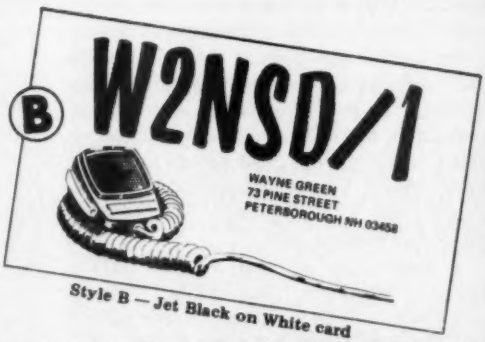

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MY FAVORITE BAND

My friends' ham shack was located in a large room adjoining their hardware store, and what a ham shack it was! The first thing that caught my eye was the huge transmitter, which completely filled one end of the room from floor to ceiling and from wall to wall. "This," said my friends, "is a home built, one kilowatt phone transmitter, with a pair of 849 tubes in the final amplifier, modulated by another pair of 849s." After answering some of my questions about their "homebrew broadcast station," my friends proceeded to turn on several switches on the transmitter, and then, with a lead pencil attached to a long insulated rod, struck some of the biggest, brightest, and noisiest arcs from the final stage tank condenser that I had ever seen! Perhaps my face showed my thoughts, or maybe my friends merely made a guess, but they gave me the microphone with the invitation to "Call a CQ or two." The CQ call I gave that day must have betrayed my excitement and inexperience, but an answer came quickly from a station in Illinois, warmly welcoming me to the 80 meter phone band.

The friends responsible for my first 80 meter QSO were Ray and Leo W9BXC of New Prague, Minnesota, and the year was 1934. Since that day in 1934, and even though I operate on several other bands, 80 remains my favorite. It was 1948 before I put a kilowatt of my own on the air, but by then high power was quite common, and it has never given me the thrill that the first QSO with the W9BXC kilowatt produced so many years ago.

Very often one hears the remark that 80 meters is an "old man's band," and that it is good only for round table QSOs or handling local message traffic. In answer to these statements, first let me say that 80 meters doesn't have any more "old men" on it than any other band, with the possible exception of the Novice bands, and furthermore, the term "old man" is much better expressed by the words "old-timers.' It might be well to remember that whether you've been licensed for as much as fifty years, or as little as fifty days, you're an "old-timer" to the fellow

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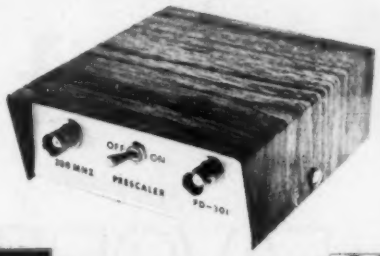

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who got his license after you did. Secondly, although 80 meters is generally considered to be a good band for round table QSOs, and traffic handling, it is also one of our better DX bands, especially during the hours of local darkness.

The question is often raised as to just what the best antenna is for 80 meter DX work. The answer to this question will depend largely on what the particular amateur concerned can provide in the way of a mast, or supporting structure; an area, or space in which to erect the antenna; and the muscle power to complete the installation. These 80 meter antenna systems range in size and complexity from a simple "inverted V" 10 or 12 meters above ground (such as the one Gus Browning and I put up for his operation as W4BPD/LX) to the two element 80 meter cubical quad, 80 meters above ground at the QTH of Bob W5KFD in Houston, Texas.

It has been noted long ago that an effective 80 meter DX antenna is the semi-vertical type, and the quarter wave length vertical, or combinations of phased quarter wave length verticals are very good DX antennas also.

I have not mentioned any form of horizontal antenna in connection with working 80 meter DX. The antenna must be one which provides a low vertical angle of radiation to be effective for DX work. This fact rules out the horizontal antenna unless it is erected approximately ½ wave above ground. Oh yes, you'll hear stations that manage to work some DX with a horizontal doublet only 10 or 15 meters high, but their DX signals will never be comparable to those of the stations with the low angle DX antennas.

It is always very difficult to put a value on how much a given station's antenna contributes to his signal, but I'd say that a ratio of 80 per cent antenna to 20 per cent power seems to be about right. I personally find I can work my share of DX on 80 with a power input of 100 to 200W.

If you don't operate 80 meters now, give it a try and find out how much fun you're missing. Like I said, it's my favorite band and it could be your favorite band too, once you get your feet wet. . . .W0SII

Peter Lovelock WA6AJZ
1330 California Ave.
Santa Monica CA 90403

THE AUDIO BISHOP

The Bishop noise limiter has proved very effective for CW and SSB reception. Series-type audio limiters usually function poorly with these modes. The Bishop circuit is connected across the primary of the last i-f transformer (Fig. 1), and with 455 kHz or

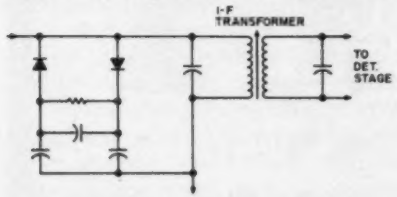


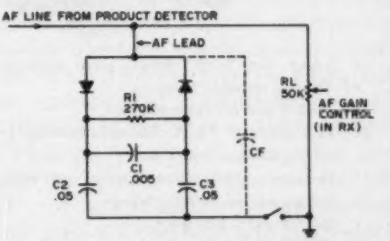
Fig. 1. The Bishop i-f noise limiter.

lower frequency i-fs, only a slight retuning of the primary winding is needed to compensate for stray capacitance.

With higher frequency i-f's in the range of 5 to 9 MHz, detuning of the primary beyond the range of adjustment and even instability, may result from attempting to add this circuit. Some commercial equipment circuits are not suitable for incorporating the Bishop limiter. This is usually in transceivers, which lack noise limiting circuits while needing them most for mobile operation.

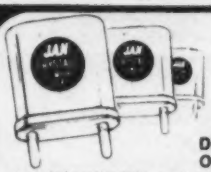
Fortunately, the Bishop limiter will work almost as well at audio frequencies as it does in the i-f region. By using the correct component values and connecting the limiter across the audio output of the product detector or a subsequent af stage, very satisfactory reduction of impulse noise peaks can be accomplished (see Fig. 2). If the limiter can be connected *before* an audio-derived agc circuit, it is especially effective in reducing the take over of receiver gain caused by noise pulses developing agc.

The audio Bishop functions just like its i-f cousin. Audio signals rectified by the two diodes develop a bias across R1 and C1, such that the diodes are back-biased and can only conduct when signal peaks exceed the bias level. Short duration pulses exceeding the desired signal level are therefore clipped. The limiter is a full wave type and is self-adjusting to the signal level.



RL	R1	C1	C2,C3	CF
10K	50K	.022	.22	.005
50K	270K	.005	.05	.001
1 MΩ	5 MΩ	.001	.01	50 pF

Fig. 2. Schematic of the audio Bishop noise limiter.



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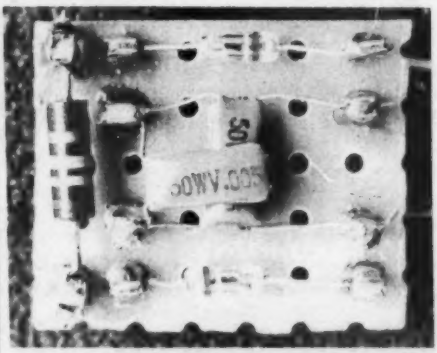
The component values are dependent upon the impedance of the audio circuit, and those shown in Fig. 2 are suitable for the 50K load (af gain potentiometer) in my Galaxy transceiver. The table shows alternate values for other common load resistors.

Some adjustment of R1/C1 values may be required for individual applications. Increasing R1 will reduce clipping, and vice versa. C1 sets the time constant of the bias on the diodes, which must be long enough to maintain bias between speech peaks. Too large a value of C1 will permit noise to increase the bias and degrade the limiting action.

The diodes are fast-switching silicon types, and the 1N916 types are typical. Any residual clipping distortion can be minimized by connecting the capacitor cf, with a suitable value to cause a 3 dB roll-off at about 2.5 kHz.



The audio Bishop component board layout.

As shown in the photo, this handy little circuit can be built on a 2.5 x 3 cm piece of perforated board. The two leads are just soldered to a convenient audio connection and ground. If you want to be able to switch off the limiter, a suitable switch may be connected between the ground lead and chassis-ground, as shown in the schematic. The circuit board may be encapsulated in epoxy, or simply wrapped with plastic insulating tape, and tucked into some convenient corner of the rig.

Come trade-in time, the limiter can be removed by disconnecting the two leads, leaving no evidence of modification.

. . .W6AJZ

Norman H Drechsel WA3KEY
P O. Box 498
Quakertown PA 18951

4U1ITU - GENÉVE

The Jet d Eau de la Rade, thrusting 400,000 gallons of water 427 feet into the air every hour appears to be much less than the World s tallest fountain from my comfortable window seat 5,000 feet above the lake. Spying Geneva through my port window on Air France flight No 026 from somewhere in the Mediterranean is just as exciting now as the first time I viewed it one year ago. The model-like city as well as the horizon disappear from view as we bank right beginning our final descent to Geneva International Airport.

Geneva isn't at all like an American city, or any other international city for that matter – unexpectedly small, peacefully quiet, immaculately clean, outwardly friendly and surrounded by breathtakingly beautiful countryside. Why? This is Switzerland, land of cuckoo clocks, chocolate, cheese and amateur radio station 4U1ITU.

Definition: "DXpedition" is operating under a special license agreement as the only amateur station in a call area recognized individually on the DXCC list. Now there are two ways to go on a DXpedition; (1) you can pack up all your gear, rent a tent, borrow a sleeping bag, generator and tin cookware set, buy controlling interest in an aluminum tubing company, make reservations with Air India along with the People's Government of the Malagasy Replublic (and by all means don't forget an extra pair of finals) or, (2) you can simply visit 4U1ITU. Assuming that we're all inherently lazy and using the excuse that we're down to our last pair of finals anyway, we'll choose the second alternative to a "DX'ers Paradise."

Once you've gotten unpacked and have secured all-day Lake Geneva steamer excursion tickets for the XYL and number one son, you're ready to head up to the "shack." Take a taxi, or better yet, stroll along the lake's east shore following the signs to Place de Nations. At the top of the hill look to the left for a large white building. The one with the "aluminum forest" on top – that's the International Telecommunications Union building. Go inside and take the elevator to the fifth floor, bear left and keep an eye out for the door with the QSL card on it. Within its walls – DX LAND – United Nations amateur radio station 4U1ITU.

After lunch I was greeted by Mr. Brossa who informed me that he was not a ham but was well acquainted with the International Amateur Radio Club and its station. He is employed by the International Telecommunications Union, which is a branch of the United Nations. One hundred and forty countries organized the I.T.U. to help regulate, plan and standardize international telecommunications. Mr. Brossa's assignment is compiling quarterly time/frequency charts of the world's international broadcast stations. A complicated and tiresome job, even with the aid of the modern Univac computer. From his pocket he pulled a key and opened the door to "RF Heaven," the HF shack of 4U1ITU. After a friendly briefing on the station's operation and equipment, Mr. Brossa wished me luck, asked that I phone his office before leaving, and then left me to my own fancy.

What a shack! From my padded swivel chair it's a sight to behold. Three walls are plastered solid with certificates and awards from every DX contest ever held. And

between the certificates, at least a thousand or two exotic QSL cards. The wall to my left from ceiling to floor is glass. The view – fantastic. In the foreground the city of Geneva. Rising majestically from the still waters of Lac Leman, the fountain, now very much fitting its title as the world's tallest. Across the lake on the sloping green countryside are the estates ih the village of Cologny. All set against a backdrop of Face du Mont Blanc, capped with early summer snow. The desk directly in front of me contains a Collins KWM-2 transceiver, 30L-1 linear and Collins station control. To my right, another table with a Hallicrafters SR-2000, external LMO and station control. The station welcomes visitors during regular business hours Monday through Saturday, and of course, any time during contests. All of the equipment was a gift from the U.S. government to the U N. – I.T.U. in Geneva. And the antennas – you name it, they've got it up on the roof!

Let's see, I'll tune up the "S-line" on 20 SSB, point the TH6-DX at about 300 degrees and see if the band's open. "QRZ Twenty, this is Four Uniform One Italy Tango Uniform, United Nations – Geneva." ZAP!! A GW3, DK5 and an SM6 all called me at the same time. "Let s take the GW3 station first, this is 4U1ITU, bye."

"Thanks for the fine QSO Norm. You're my first 4U1, *please* QSL. 73 and good luck to you there in Geneva. 4U1ITU this is GW3UK, clear." The frequency erupted – the KWM-2's "S" meter flew off scale, so did I! I was under an unbelievable pile-up. "The JW8 station on Bear Island, please call again. This is WA3 – er, sorry – 4U1ITU, bye."

There was more DX on that frequency than K3HTZ and the combined membership of the Frankfurt Radio Club could shake a driven element at! Hour after hour, QSL card after QSL card, log page after log page, without ever touching the VFO, the pile-up grew steadily. "OK gentlemen, we're going to take a break now. I'll be back in five minutes. This is 4U1ITU Geneva temporarily clear." "Click" – silence on the frequency, but a thousand ears waiting for my return. While gazing out the window I heard a G3 tune up and then call CQ. He was immediately jumped on by two stations simultaneously, who told him to QSY or wait his turn for the 4U1.

"We're back, gentlemen. Thank you for waiting. This is 4U1ITU United Nations – Geneva, bye on the frequency." After working another page of stations I decided that if I was to keep my 7:00 P.M. dinner engagement, I had better say 73 and pull the big switch. "Yes, I'm filling your QSL card out now. Thank you for the call, and I'll look for you from the home station. XK2AE this is 4U1ITU standing by for one more contact before shutting down. This is 4U1ITU – Geneva, go ahead."

The whole band broke loose this time. It was all I could do to single out a call, but pick one I did. I completed the QSO, bade everyone 73 and thanked them for their patience. "This is United Nations radio station 4U1ITU with WA3KEY at the mike, at the International Telecommunications Union Building in Geneva, clear." As I turned off the KWM-2 and the receive audio faded away I could still hear stations calling – "One more QSO. This is 9Q5 . . ." "Just a signal report, please . . ." "QRZ 4U1 . . ."

I entered a note of thanks in the station's visitors log and phoned Mr. Brossa, who said he'd meet me at the door and call a taxi for my return to the hotel. (Or in your case, a taxi to Pont du Mont Blanc to pick up the XYL who has already been waiting two hours!)

"How do you like it here?" Mr. Brossa asked. "Can you come back tomorrow? We'd like to see the station on more often. We have an extensive library on communications on the ground floor if you'd like to stop back in the morning." What could I say? What would you say? "I'm sorry, Mr. Brossa, I'm leaving for London in the morning. I had a wonderful time operating the station. I sure wish I could stay longer. Thank you very much."

"Next time," he replied. "Yes, next time," I smiled. "I'll be back next time."

How about it – next time you take a vacation, tell your wife she doesn't really need a new washer and dryer. Or take a second mortage on your new 2-FM rig. Go DXing 4U1 style.

. . .WA3KEY

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Have you ever wanted to set a needle gap or a ball gap for a desired arc potential but didn't have sufficiently high voltage for checking purposes? Or have you ever wanted to know the voltage rating of a surplus air variable capacitor? This procedure makes use of a common dc power supply, a means of measuring capacitance below about 1500 pF, and a bit of basic theory.

The procedure is as follows:

1. Set the capacitor to full mesh and measure its capacitance with a capaci tance bridge, or determine its value by use of a standard inductance and a grid dip meter. Call this value C_{max}
2. Charge the capacitor with a dc power supply having about 500V output.
3. Remove the power supply lead from the capacitor stator terminal and *immediately* begin to rotate the capacitor shaft toward minimum capacitance. When the arc occurs due to voltage build-up in the capacitor, stop rotating the shaft.
4. Measure the capacitance at the shaft rotation which produced the arc. Call this capacitance C_{arc}.
5. Calculate the arc potential where $E_{arc} = E \times C_{max}/C_{arc}$.

For example, a 15–400 pF capacitor is charged with a 500V supply and then rotated to the arc setting which measured 100 pF. The arc potential is calculated as $E_{arc} = 500 \times 400/100 = 2000V$. Two or three additional tries with different shaft rotation directions and/or different supply voltages may be used to obtain a group of measurements from which to arrive at a reliable average value. If C_{min} is too close to the minimum capacitance of the capaacitor, use a higher power supply voltage. If C_{min} is too close to the maximum capacitance setting, use a lower power supply voltage. Experience shows that a 20% variation in results is common.

Theory of Operation

Recall from the study of capacitance and charge that the charge in coulombs is equal to the product of capacitance in farads times voltage in volts.

$$Q = CE$$

The initial charge received by application of the supply voltage does not have sufficient time to leak off as the shaft is rotated toward minimum capacitance. The reduction of capacitance then must be accompanied by a proportionate increase in voltage to maintain the product CE equal to Q. Thus it can be seen that

$$Q = C_{max}\,E = C_{arc}\,E_{arc}$$

Rearranging the above products to solve for the unknown E_{arc} yields

$$E_{arc} = F \times C_{max}/C_{arc}$$

Notice that the capacitance values form a ratio so that pF may be used as the units of measure. Also it can be seen that the ratio of voltages equals the ratios of capacitance. A 4/1 ratio of capacitance in the above example yielded an equal ratio of voltages 4/1.

This procedure is used on needle gaps and ball gaps by connecting the gaps across the capacitor during the measurement procedure and adjusting the gamps until the correct capacitance ratios, and thus voltage ratios and E_{arc}, are obtained. Obviously, the capacitor used must have a higher voltage rating than that of the gaps.

If ambient noise prevents hearing the small arc, especially for low value capacitors, a darkened room may be required for the sparking to be observed. Use caution with both the power supply and capacitor. A series resistor, or resistors, at the power supply output, can provide a current limitation and thus an electrocution preventative. Any value of resistance from about one megohm up to ten or twenty megohms is acceptable.

Happy zapping!

. . .W9SIA

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711	Dual Diff. Comparator	T05 or Dip	.30
723	V Regulator	T05 or Dip	.60
741	Comp Op Amp.	T05, Mini, or Dip	.40
747	Dual 741 Op Amp.	T05 or Dip	.80
748	Freq. Adj. 741	Mini	.40
1303	Stereo Pre Amp.	Dip	.75
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05	.20	40	.20	H74	.60	S140	1.50	182	1.00
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07	.40	L42	1.50	H76	.60	152	3.00	191	3.00
08	.20	43	1.50	H78	.80	153	1.00	192	1.50
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09	.20	45	.90	83	1.00	154	1.50	L192	2.00
10	.20	46	1.50	85	1.50	155	1.00	193	1.50
H10	.30	47	1.50	L85	2.50	156	1.00	L193	2.00
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S11	.50	H51	.30	89	3.00	160	1.50	197	2.00
12	.50	H52	.40	90	1.00	161	1.50	198	2.00
13	.75	53	.20	L90	1.25	L161	2.00	199	2.00
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USE THAT 120 VOLT VARIAC ON A 220 VOLT CIRCUIT

There are many times when a variable source of 240V would be very desirable. Unless a Variac or variable voltage transformer is used, the varying of the ac voltage is quite difficult.

Many types of these variable voltage devices are on the surplus market; however, most of these are for use on a 120V line usually furnishing voltage up to 135V.

Should one want to vary the 240V source, the need arises to obtain a Variac for 240V. However, should you have one and it is for 120V only – don't give up. It can be used for this voltage. By connecting the Variac as shown in the diagram, you will notice that both lines of 240V and the neutral, are brought to the Variac. By means of a double-pole, double-throw switch, one may in one position obtain 0–135V and in the other position, 0–255V. This connection will give full coverage from 0 to 255V.

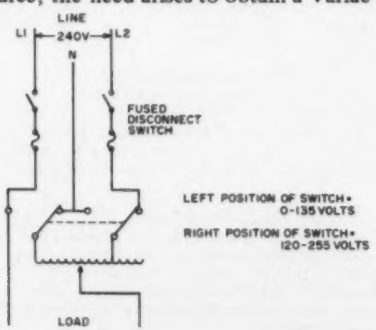


Fig. 1. Variac connections for 0–255V coverage.

I have told many amateurs about this connection and they were very pleased that they could use their 120V component on the 240V source. There are many uses for this circuit – varying the input voltage to transformers, for charging batteries, primaries of silver plating transformers, and others too numerous to name.

I have used this idea on the primary side of my 240V plate transformer, and it is very useful in tuning up the high power amplifier by voltage reduction on the plate.

So, boys, drag out the old 120V Variac, blow the dust off, and put it to use.

. . .W4GD

Ralph E. Taggart WB8DQT
4515 Oakwood Drive
Okemos MI 48864

Western Satellite Picture On Your SSTV MONITORS

Most radio amateurs are probably armchair astronauts at heart. With this interest in the space program, the idea of receiving weather sateilite pictures has probably occurred to many. The problems of setting up a receiving station and acquiring and operating suitable facsimile apparatus has probably discouraged many of those who have considered the problem. This article will describe a simple video converter system that will permit satellite pictures in the APT (Automatic Picture Transmission) mode to be displayed on standard SSTV monitors with only slight monitor modifications which will have no effect on the monitors function in the SSTV mode. In addition, the use of readily available 2m FM gear in the satellite receiving system will be described.

The APT Picture Mode

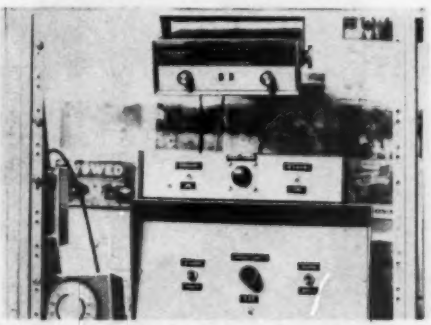
APT pictures are transmitted at the rate of four lines per second for a total of 200 seconds, producing a high resolution 800 line picture. The video and sync information are transmitted by varying the amplitude of a 2400Hz audio tone. The video shift from black to white is accomplished by varying the subcarrier from near zero to 80% of full amplitude. A sync pulse lasting 12.5ms is transmitted at the beginning of each line as a burst of 100% subcarrier amplitude. The

pictures are transmitted in the FM mode in the 135 to 138MHz band. The deviation of these signals is approximately 10kHz.

There are presently three satellites transmitting in the APT mode. ESSA 8 (137.62MHz) is in a near polar orbit at an altitude of approximately 900 miles. This satellite makes approximately three useful daylight passes per day within range of a normally equipped ground station. Unfortunately, ESSA 8 is nearing the end of its operational usefulness in that picture quality is declining rapidly. There are no other satellites of this type planned for use with APT. Two other satellites, ATS 1 and ATS 3, are presently relaying excellent APT pictures on a worldwide basis and systems of this sort will probably be operating in the foreseeable future. These two satellites are located in syncronous orbits over the equator and thus maintain the same relative position in the sky at all times. This is very convenient in that an antenna can be permanently aligned on the satellite of interest. Since there is no relative motion between the satellite and the ground station there is no doppler shift. Fixed tuned receivers of relatively narrow bandwidth can thus be employed effectively. The ATS satellites retransmit computer gridded photos from the NOAA 2 satellite providing cloud cover photographs with map outlines for most of the earth's surface. ATS 3 also provides spin scan photographs of excellent quality, examples of which are provided in this article. The spin scan system on ATS 1 is unfortunately no longer functioning. The six spin scan photos available from ATS 3 each day provide an overlapping photographic mosaic which covers virtually all of the northern half of the western hemisphere. These pictures are very clear and excellent terrain details can be observed if the weather is clear over the area of interest. The primary emphasis in this article will be on the reception of ATS photographs.

The Receiving System

The wide availability of 2m FM gear makes the construction of the receiving system an easy task. Most of this sort of gear can be set up on the satellite band by merely substituting the proper crystals and repeaking the front end circuits. The ATS satellites have low powered transmitters and this in combination with their extreme altitude (22,000 miles) require good receiver noise figure and sensitivity. A good MOSFET preamplifier would probably be adequate even if a relatively poor receiver is used as the heart of the receiving system. My own installation, illustrated in Fig. 1, uses a Heathkit GR-110 scanning receiver with a number of satellite crystals, including the 135.6MHz frequency used by ATS 1 and 3. A Vanguard model 201 preamp tuned to 136.5MHz provides the required system sensitivity and noise figure.



Heath GR-110 scanning receiver with video adapter.

My own solution to the antenna problem consists of the simple expedient of using a HyGain 8-element yagi for 2m. This antenna provides excellent results despite the off-resonance operation. My own experiments indicate that the ATS signals are horizontally polarized and the antenna should be oriented with this in mind. I would be happy to provide data on aiming the antenna to anyone who is actually constructing a receiving station. The process is fairly simple but would take up more space then is justified in an article of this type.

ATS picture transmissions are on a daily scheduled basis. I use a 24-hour timer to turn on the recorder and receiving system at the proper time each day. The nature of the video converter is such that recordings of the satellite pictures are indistinguishable from "live" transmissions and the use of tape is very convenient. Recorders with automatic

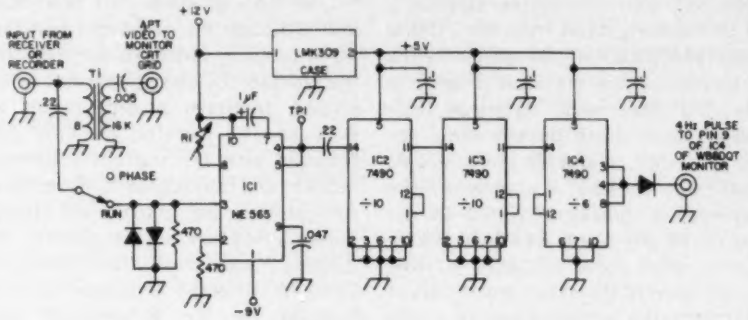


Fig. 1. Schematic of video converter.

level control or other forms of agc may not be desirable in that they may "swamp out" some of the amplitude variations in the audio signal, but these types of recorders should not be ruled out without a trial. My own recorder is an old two track monaural machine which provides excellent results at 3 3/4ips. Results are equally good at 1 7/8ips but the faster speed makes for a more accurate cueing job. Recorder and receiver audio gain should be kept constant from day to day to eliminate the need to constantly make gain adjustments during picture readout. I find the most convenient procedure is to set the receiver and recorder gain for maximum allowable VU meter reading of the recorder using the noise output from the receiver prior to a picture transmission. This noise output is a convenient reference level that will not change and has the advantage that its always available. The constantly varying subcarrier level in the actual picture transmission cannot be used for this purpose unless an oscilloscope is available to assess peak signal values. Obviously the use of the near "white noise" output of the receiver is an easier solution.

The Video Converter

The functioning of the video converter will be outlined on the basis that it will be interfaced with the WB8DQT SSTV monitor (73 Magazine, August 1973). The basic functioning of the converter is unaffected by the monitor used, but the precise component values used in the modification of the monitor will vary with other monitors and some experimentation will probably be required.

Proper display of the satellite video on the monitor crt is easily accomplished. APT output from the recorder is routed to the video converter input where the varying 2400Hz subcarrier is stepped up in voltage by T1 and applied to the grid of the monitor via a .005µF capacitor. The brightness of the crt trace will increase with an increase in subcarrier amplitude. Despite this rather simple scheme for video display, an excellent gray scale is achieved and there are no dc restoration problems. The volume control of the tape recorder is used as the system contrast control.

The sync system is slightly more complex and involves most of the circuitry of the

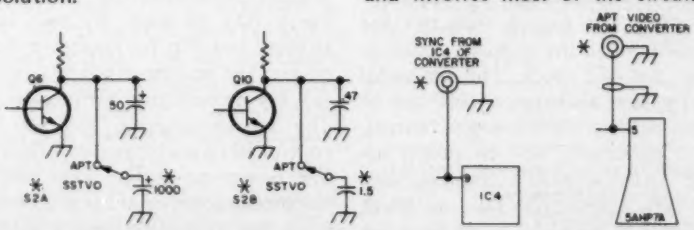


Fig. 2. Required additions to the monitor circuit to incorporate the APT mode.

unit. The 4Hz line rate in the satellite is derived by counting down from the 2400Hz subcarrier (2400/600 = 4). We will derive the proper timing for the crt video display in precisely the same way. Although it is possible to count down directly from the satellite subcarrier, a slightly more reliable procedure was chosen. A sample of the 2400Hz satellite subcarrier is fed to the input of an NE565 phase lock loop (PLL). Only a very small audio voltage is required for the operation of the device and diodes at the input limit the applied signal to a safe value. The PLL contains an internal voltage controlled oscillator (vco) which, with proper selection of the external components, will lock onto the audio frequency present at the input. The PLL vco tracks any variations in the frequency of the subcarrier signal at the input and thus compensates for any frequency variations introduced by the recording process. The vco output is essentially noise free even if high noise levels are present at the input of the PLL. The output of the vco serves as the frequency standard for the sync system and is divided by 600 by three 7490 decade counters to produce a 4Hz square wave with the proper sync relationship to the satellite subcarrier signal. The 4Hz signal is fed to the horizontal monostable in the monitor where it triggers the horizontal deflection system 4 times per second. In order to achieve proper sweep size and linearity, an additional 1.5μF capacitor must be paralleled across the existing 0.47μF horizontal discharge capacitor in the monitor circuit. The required 200 second vertical sweep is initiated manually using the vertical reset switch on the monitor. An additional 1000μF capacitor across the normal 50μF vertical discharge capacitor provides the proper vertical sweep parameters. Fig. 1, shows the schematic of the video converter itself and Fig. 2, indicates the required additions to the monitor circuit to incorporate the APT mode. The additional capacitors in the discharge circuit can be switched in with a DPDT toggle switch, providing a convenient way to switch between the SSTV and APT displays. The video and sync connections have no effect on the monitor in the SSTV mode when the video converter is not in use.

The only problem that now remains is that although the line display on the monitor is properly synced to the line scanning in the satellite, the display may not be properly phased. Improper phasing means that the start of the monitor scanning does not coincide with the start of scanning in the satellite and is indicated by the presence of a vertical white bar, actually the satellite sync pulse, somewhere in the picture. The free-running frequency of the PLL vco is set to 2350 Hz. When S1 is thrown to the phasing position the vco is unlocked from the satellite subcarrier and runs free, putting the horizontal display out of sync. When this occurs the white sync bar will shift over to the margin of the picture since the satellite line rate and monitor line rate no longer coincide. When the bar reaches the picture margin S1 is returned to the run position, the vco locks to the subcarrier, and a synced condition is re-established. This process is summarized in a diagram in Fig. 3.

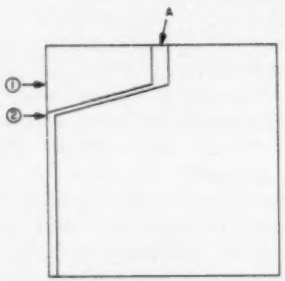


Fig. 3.

Converter Construction

The circuitry is essentially non-critical and any mechanical assembly which permits proper interconnection of the circuit elements may be used. My own unit is constructed in a Ten-Tec enclosure shown in the photo. The unit need not be large and could actually be built into the monitor if desired. The power, phasing, and vco frequency control (R1) are located on the front panel. The power connector, input and sync and video output are on the rear apron. The sync and video connectors added to the monitor can be placed on the rear apron. The DPDT

toggle switch for changing between the SSTV and APT display is most conveniently located on the front panel of the monitor although this is certainly not required.

Alignment and Use

Place S1 in the "phase" position and adjust the vco frequency control for 2350Hz at TP1. This frequency is not too critical and initially setting up for a frequency just slightly higher than the 2300Hz SSTV white frequency will do for a start. If the free running vco frequency is too close to 2400Hz phasing will take longer to accomplish while if the frequency is too far from 2400Hz phasing will be too rapid to be accomplished accurately. In practice, the final setting of R1 is adjusted to provide a comfortable phasing rate.

The monitor display should be viewed in a darkened room to visually evaluate the nature of the pictures. A darkened room is absolutely essential for photography since a 200 second time exposure is required. With no APT input adjust the monitor brightness for a barely visable trace. Advance the APT recorder output for a good black to white video swing on the monitor display. If the vertical sync bar is present, place S1 in "phase" until the bar moves to the margin of the picture and then return the switch to "run."

Operational Notes

ATS 3 transmits on a frequency of 135.6MHz from 0730-0815Z and 2045-2130Z. The first transmission of the day consists of APT orbital prediction data and NOAA 2 gridded pictures. The second transmission sequence consists of 6 spin scan photos and updated NOAA 2 photos. There is a white calibration signal transmitted between each picture and phasing is easily set up at the beginning of a picture sequence. As long as the recorder is not turned off, proper phasing will be maintained throughout an entire sequence of pictures. The start of each picture is clearly audible and the vertical reset switch can be pressed to initiate the vertical scan.

Photographing the display consists of making a 200 second time exposure as the display reads out. I have used Plus X and Panatomic 35mm film. Polaroid also works well. The 73 SSTV Handbook contains information on making photographs from a monitor display and the same techniques may be used for the APT pictures.

There are a total of six spin scan photos transmitted each day by ATS 3. These photographs are part of a single photographic mosaic. The photos fit together, in order of their transmission, as shown in Fig. 4.

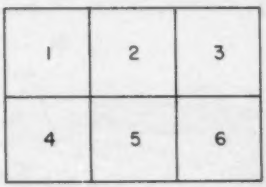


Fig. 4. Mosaic plan of 6 spin scan photos.

The best pictures are obtained when the satellite signals are full quieting in the receiver, although acceptable pictures are possible even with relatively high noise levels. For best results, you should optimize the system for full quieting operation. This is not difficult and is well worth the trouble. The satellite signals are remarkably consistant from day to day, although observations by myself and WØOQC indicate that some drop in signal level often occurs when strong tropo openings are present. If you have difficulty in maintaining a consistantly high signal level you might try mast mounting a preamp.

There is an endless fascination in watching the earth from space and I hope some of you will give it a try. This is an ideal activity for those already involved in Slow Scan and provides another excuse for those of you who haven't tried it yet. Come on in and double your fun!

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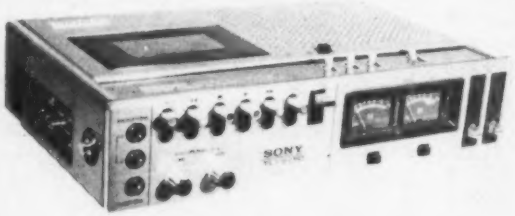

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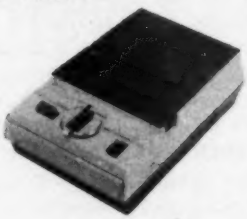

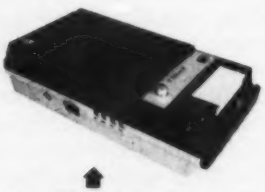

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Someone Should Do Something About...!

There have been many requests for help from club presidents, club members, and people who are trying to form clubs. This article, originally printed in April, 1966, gives a dramatic picture of the typical ham club. The author, now assistant in charge of Amateur and CB affairs of the FCC, also advises that the club president is not elected as an honor – he is elected because it is believed that he can perform the work necessary to prevent the club from looking like that in his article. One of the biggest mistakes the president can make is to push his pet ideas; he should be able to guide the club in the course of action that they want to take. The president is a leader and should set an example for each future president of the organization.

One of the more interesting facets of amateur radio is the opportunity to participate in unique organizations loosely identified as 'radio ham clubs." Upon considering that each member has progressed through a filtering process designed to eliminate all but the most dedicated, it is interesting to observe the results. First he has had to culture an interest in a very demanding hobby, subject himself to an agonizing period of learning rules, theory, customs and Morse code. Next under protest, he has indulged in outrageous expenditures for equipment. Then he has been further motivated to seek out the companionship of similar individuals. Finally, he not only endures, but delights in, attendance at regular club meetings.

These meetings follow proceedings that have been universally adopted. One familiar with these rituals can freely move from one geographical location to another and find solace. Unfortunately, these rites are not documented and the uninitiated must learn them the hard way. The constitution of any given club is usually of little benefit, for example, and reference to it can only result in confusion.

The most important things to bear in mind are that the members attend these meetings for entertainment (viz: night out from the XYL), and the club president is charged with providing some type of diversion, such as a speaker. In fact, some observers are of the opinion that this is his only purpose, and his re-election is dependent upon his degree of success in this vain.

All radio club meetings are called to order 45 minutes after the announced time. This allows a period for members to indulge in a quaint pastime known in amateur radio as the "eyeball QSO." This informal preliminary event is comprised of impromptu discussion centered on three (3) general areas of exaggerated claims:

1. Lamentation of the heavy demands placed upon one's station by rare DX operators desiring a QSO.
2. The amount of high power one is utilizing, including various precautions to insure that a minimum of 1 KW output is always maintained.
3. The vast superiority of one's equipment; the extent of the claims being in proportion to his desire to unload it.

Of particular note are the audience participation entertainment meetings where a special game is played. The neophyte would be advised to suppress his urge to fully participate in this game until the rules are fully understood. It begins with the president announcing. "Tonight will be a business meeting!" meaning he couldn't obtain a speaker.

Upon this signal, the members are alerted to critically observe the proceedings, concentrating upon finding the "debate item." As the chairman routinely calls upon each committee head for a report, some of the more dedicated members warm-up for the main debate event with comments and questions somewhat relevant to the report. Candidates for team captain can thus identify themselves.

The main debate item is usually selected between 15 and 20 minutes after the call to order, when boredom has set in. While the scope of these items are vast, there are certain criteria which must be met in order to enjoy full participation.

1. Under no circumstances must the debate item result in any additional work for anyone except the president.
2. It must not encompass anything of real consequence. Abstract and theoretical subjects are ideal.
3. It must not be so complex as to allow for more than two points of view.

After several false starts, the debate begins to unfold. The teams can be identified as play continues. The chairman must make an important decision which has a significant impact upon the organization of the two teams. If he elects to assume the neutral role of an umpire, the teams are divided by an imaginary front-to-back line down the center of the audience. On the other hand, when the chairman declares himself a player, the division is automatically front vs. rear. Because the chairman holds a strategic position in the room (and often is a little more informed on the background of the subject), his unfair advantage is offset by limiting his team to those on the rostrum and – depending upon the size of the audience – from one to three of the front rows.

The tap-off is initiated by a potential team captain who arises and demands "that something be done!" concerning a certain item. It is imperative that he not be specific about what should be done or by whom, thus preventing a premature completion of the game. Heroically seizing the initiative, a candidate team captain for the other side recognizes the challenge and rises in reply. It is not pertinent that his retort reveal any great enlightenment – delivery is the critical aspect of winning these coveted positions. When the debate item is acceptable to the audience, they so signify by responding to the call-to-arms, and the main event can proceed.

Observing protocol, members from each team rally to their selected captain and alternately rise to repeat his argument, interspersing their commentary with items usually unrelated to the subject. The individual member can find great comfort in addressing the captive audience and is willing to endure listening to the others in return for his opportunity to get a few things off his chest. (Most covered topics: CB, deplorable state of amateur radio, TVI). Besides, 50% of the audience is on his side before he even starts.

Veteran observers are quick to point out the upswing of interest in the game since the wide acceptance of VOX keyed transmitters. Before this dastardly technical

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advancement, an operator could pour out his feelings into a microphone for all the world to hear (in reality, it would only be one other ham who was partially copying R3 X S4 with heavy QRM), and he could rave on until he got good and ready to manually throw the transfer switch. He now feels frustrated by automation since every time he pauses to take a breath during his discourse, he is vulnerable to being cut-off. An individual with this particular problem can be rapidly identified in everyday life by his continual interjection of the phrase, "AWWWWW," after every sentence.

In the unfortunate situation where the audience seating arrangement is such as to make the imaginary division line indistinct, an individual not quite sure of which side he has been assigned may be prompted to arise and summarize the two positions, and either offer a compromise or request a motion. This is an obvious delay of the game and he is penalized by a loud admonishment by both sides as he slinks to his seat. Outcast, he remains silent and makes note not to sit in the middle next time.

The game is completed when an arbitrary time limit is reached, usually 10:45 PM. The finale is quite rapid with the chairman dissolving the two teams by requesting volunteers to work on the problem. This is the signal that the game is over and everyone is to remain silent.

Any important items are disposed of rapidly without comment within the next 5 minutes so the meeting can be adjourned to a nearby tavern for a victory celebration by both sides. The team captains shake hands and agree, "It was good to clear the air!" Midnight having been established by XYL s, Inc. as the "time-to-be-home-from -the radio club by," the "eyeball QSO is resumed with the sky-the-limit for exaggerated claims, until the magic hour.

As the members happily return to their homes with fond memories of a battle well fought, mentally rephrasing what they said or wish they had said during their speech, the true value of the radio club can best be appreciated. . . .K3BNS

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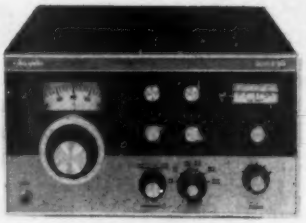

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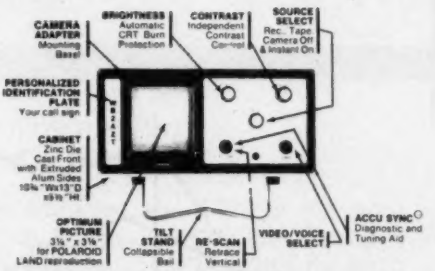
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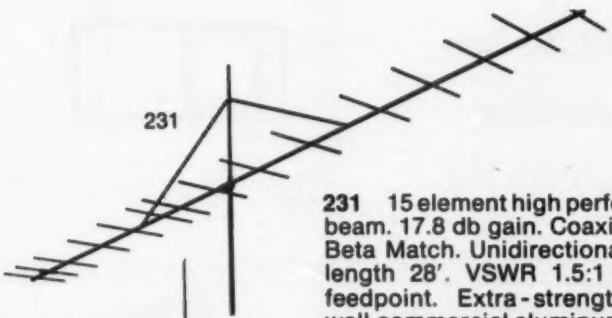

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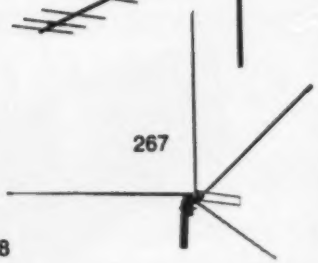

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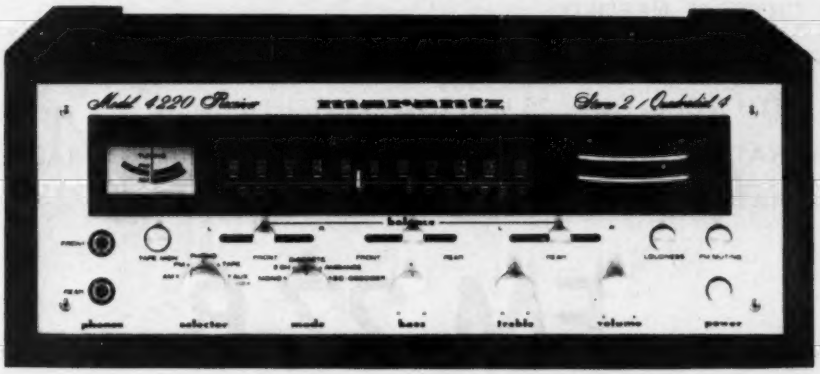

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Del C. Wininger WB6JNI
7400 Tiptoe Lane
San Jose CA 95129

NOSTALGIA

I will never forget the day in 1922 when Bud came running breathlessly over to my house, "Come quick, Howie just built a radio." We lined up to hear KUO, the San Francisco Examiner on "genuine Brandese earphones." We gaped at the wonder of such technology. The radio consisted of wire wrapped around a Quaker Oats box (round and about 6" in diameter). On one end of the box were two binding posts and the cat whisker – that part that gave magic to the whole system. To tune the radio there was a slide contact that shorted the turns to one end. There was no capacitor as the intrinsic capacitance of a coil that large was enough to provide all that was necessary.

Every one of us rushed home to beg our folks for the wherewithall to build a radio. Magazines and newspapers had construction plans and Woolworth's 5 and 10 had a 50 foot counter loaded with gadgets and gimmicks necessary to create electronic wonders.

These were the days of solid state radio. We chose galena holders and cat whiskers with more care than a computer man with Motorola's handbook. We swapped galena of all kinds, many things worked; iron sulphide, lead sulphide, carborundum – we went to an old iron mine and dug through the tailings for choice pieces of pyrites. Every time you got a station coming in real well someone would jump on the floor and the music was gone. Looking back, I think the doping in natural crystals wasn't uniform and there were sensitive and dead places all over the crystal. Solid state manufacturers will say, "If you think that has changed you should see my rejects."

It was a proud day when I got my first "variable condenser" (capacitor to you kids). It had round plates, about 40 of them, and all the stations were jammed down on one end of the dial, but it enabled smooth tuning without jumping the cat whisker off the sensitive spot. Then that damned kid across the street built a one tube regenerative tuner and solid state was set back for forty years.

I graduated to radio tubes and kept myself broke buying dry batteries. The 45 volt B batteries cost the most and seemed to die when you wanted to show your receiver to someone. The A batteries were what we

called doorbell batteries and when they got weak you punched holes around the bottom and put them in a pan of water and vinegar and they came to life again.

The most popular circuit was the regenerative tuner we knew about the superheterodyne but why use eight tubes when you could do the same thing with one tube. I had a modified colpits circuit receiver and one time at 3 AM California time, I heard KDKA in Pittsburgh, PA. We did a lot of DXing on broadcast band in those days; records only ran three minutes and station announced after each record. The big problem was the QRM. Every time a station would start to announce some nut down the block would try to tune in and heterodyne with your receiver with nothing but cat calls.

I took radio code in high school. You had to receive six words per minute to get a ticket. We would go around the school whistling dirty words to each other. This would start at a real high pitch and gradually go down to almost inaudible – in an imitation of what you could hear on the air. There was no such thing as frequency stability. When you copied someone you held your hand close to the tuning knob and moved it back and forth to adjust the pitch with body capacity. Radios were built on Bakelite panels and the wiring was composed of bus bars about 1/16" square and all made parallel with right angle bends – to look nice, and there was more feedback and capacitive pick-up than anyone dreamed. We knew that a finished set hardly ever worked as well as the bread-board model but we hadn't figured out why.

Carl was the first kid in our set to build a transmitter. We talked about it a lot before it came to reality. By now it was 1928 and we wanted to construct a real state-of-the-art set using a vacuum tube, and direct current, and we especially wanted to get on 20 meters where you could hear half way around the world. It was getting real popular, sometimes there would be five or six stations on the band at one time. Carl had scrounged a commercial type vacuum tube from a local radio station; it was gasey but it worked fine. When you pushed the key it would light up the whole room with a beautiful blue light. It was a beautiful effect with the bright red plate (we hadn't discovered neutralization yet). The direct current was a dramatic system composed of a 4 kv utility transformer run backwards into a string of rectifier jars containing borax solution and aluminum and iron plates. When you hit the key everything hummed and bubbled and steam rose up and fogged the window. There was no code monitor you could hear your transmitter, and see it and smell it. In spite of the dc, we got a lot of rac reports (raw alternating current) filtering was not yet a science. The best reports came from far away – Hawaii and Australia always liked the tone. We had lots of power, the problem was in getting it to go out that wire into the antenna. We spent more time building antennas and counter-poises, and feeders than we spent on the air.

From 1928 to 1930 things moved rapidly. Rectifiers became well known and transmitters were all push-pull output. Crystals became popular. One kid in school was a real nut – he said that pictures could be transmitted by radio and just to prove it he had a setup in his basement where he scanned a picture with a disk with spiral holes in it. About twenty feet away there was another disk that scanned the light from a neon bulb – and with the lights out, and your eyes used to the dark, you could see a sort of image. But anyone with any sense knew that nothing like that would ever be practical. That's why I now believe in everything; flying saucers, justice, equality of man, any crackpot idea you can present.

They say that a man may go far but he never entirely leaves his first love – that may be true; I still think that 40 watts of CW on 20 meters is just fine. Most of my gear is store bought now, but out in the garage is a junk box and I was looking for something the other day and I came across a little 1/2" diameter cup with a screw in one side and a hold in the bottom – a galena cup!! A little more searching turned up a 10Ω rheostat, a carbon pile resistor, two thyratron rectifiers, a matched pair of 6L6's, and a Tesla coil that would do wonderful things, including jamming all the communications within five miles. Sic transit gloria mundi.

...WB6JNI

Walter W. Pinner WB4MYL
7304 Lorenzo Lane
Louisville KY 40228

A UNIVERSAL IC TESTER

The appearance of the 8¢ IC has made apparent the need for a unit which would test and identify both marked and unmarked IC's. The units referred to are available from Poly-Paks. They are TTL, 14DIP at the attractive price of 60/$5.00. Several groups of these units have been purchased and of these, more than 80% were identified. The balance were assumed to be defective or not properly identified for test.

A block diagram of the box functions is shown in Fig. 1. I will describe in detail the pulse generator, which may also be used as a separate variable frequency square wave generator with the proper timing capacitor for frequencies up to several hundred kHz. Figure 2 shows the LOAD INDICATOR circuit. I'll leave the power supply to your imagination since too many words have been wasted already in articles on how to construct power supplies. In the event you already have a bench supply, you may wish to eliminate this section anyway.

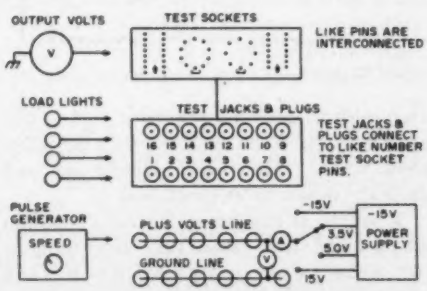


Fig. 1. Block diagram, IC tester.

An IC, let's say, a SN7400, to be tested, is inserted in the proper socket. Being a TTL unit the power supply is set for 5 volts. A plus voltage plug is connected to jack 14 and a ground plug to jack 7. A power supply current of less than 25 mA indicates the device is not drawing excessive power. A load indicator is now connected to one of the output leads (say #3) and the pulse generator connected to one of the inputs. Observing the load indicator and connecting the output meter to the input being tested will show the action of the device under

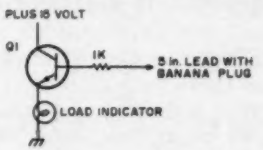
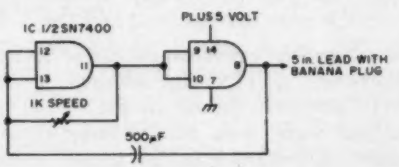


Fig. 2. Circuit 2. Load indicator.



Circuit 1. Pulse generator.

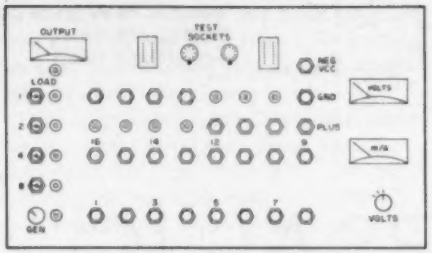


Fig. 3. Construction details.

Construction Details: All common numbered socket pins are interconnected. Socket pins 1 thru 16 are connected to test jacks 1 thru 16.
BANANA JACKS.
5 inch leads with banana plugs attached.
All jacks and plugs in the plus row are interconnected.
All jacks and plugs in the GND row are interconnected.
The voltage select switch connects the PLUS row to the indicated power supply voltage.
OUTPUT VOLTS Same as power supply voltmeter
LOAD INDICATORS Circuit #2
SQUARE WAVE GENERATOR
METERS – Surplus VU. Volts – Use multiplier for 15 volt F.S.
M.A. Meter use shunt for 35 M.A. F.S.
VOLTS CONTROL 3.5, 5.0, 15V.

actual conditions. All IC data books give TRUTH TABLES which will show you what to expect.

In addition to the leads in the box, 3" or 4" leads with plugs on each end are handy for cross coupling gates as oscillators, or to jump required pins on some units.

An IC data book is a must for identification of unknown units. A check of the various base diagrams will disclose there to Vcc voltage, If you find voltage at pin #3 the usual pattern is that pins #1 &2 are inputs. Connect the pulse generator to these pins and observe the meter or load indicator connected to the output for an indication.

In testing OP AMPS and regulators, which are basically direct coupled high gain amplifiers, follow the same procedure for Vcc and ground. Find an output and apply the generator input at a very low level. You may

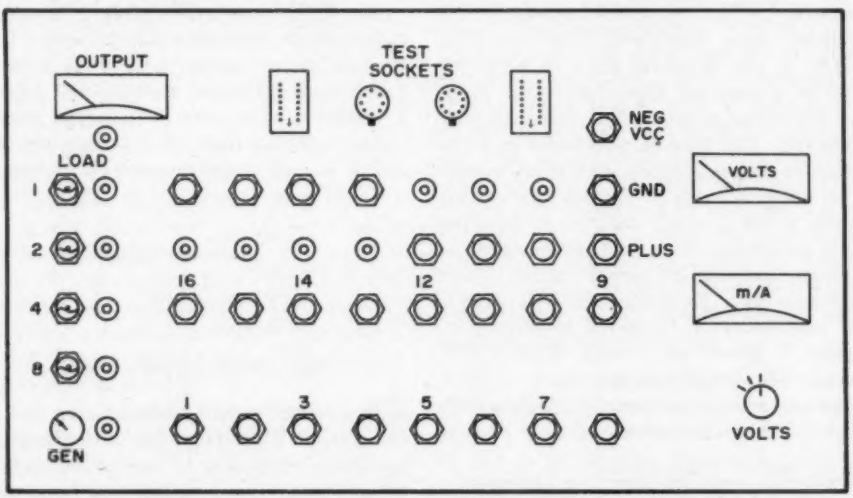


Fig. 4. Full size layout of IC tester.

be a somewhat consistent pattern to the lead functions. GATES for instance in the TTL/7400 series usually use pin #14 as Vcc or plus volts, with pin #7 being ground. Insert an unknown in the proper socket, connect Vcc and ground and check the power supply current for a reasonable reading. Now with the output meter lead search for any pins that show a voltage near the even wish to hold the generator lead in one hand and touch the input pin with the other hand. Crude, but it will identify pins and show the device to be functional.

I believe at this point, further discussion would be of little value. Take an evening or two, build the box, order a batch of IC's and have some fun.

. . .WB4MYL

Carl C. Drumeller W5JJ
Oklahoma City OK 73169

TABUS

We like to consider ourselves an enlightened people. Oh, we may kid a bit about black cats crossing our paths, and things like that . . . but, superstitious? A thousand times NO!

Oh? Then how about the tabu on using liberal heat while soldering or desoldering transistors? "Everybody knows it'll destroy a transistor." Like hell it will! I've taken hundreds of transistors off circuit boards, getting them hotter than the proverbial little red wagon, then popped them into my transistor tester (an oscillator at 7 MHz), and found them still to be in good operating condition.

Another tabu: Never try to bridge a gap between two wires with solder; it can't be done. Again, like hell it can't! It does it all too readily, as anyone who has ever tried to tap on to an Air Dux coil or has worked with close lines on a PC board knows full well!

Another tabu: Don't use soldering paste; it'll result in unreliable joints. Maybe, but I've used it (only with those stubborn metals or finishes that laugh off ordinary solder) for over 45 years and have yet to see a joint that was adversely affected.

Another tabu: Never dare solder without having first joined the two items in a strong mechanical joint. This tabu undoubtedly was started by the Devil himself! One does not have to be a fundamentalist in his religious beliefs to have a firm conviction that there must be some special corner of Hell reserved for those who make mechanical joints before soldering. The hottest portion is for those who use stranded wire. Those condemned souls labor through all eternity vainly attempting to clear lugs from tightly twisted wires! It'll soon be 52 years since I built my first piece of amateur radio gear. In all those years, I can't recall an instance of having seen a joint fail because of not having been made mechanically strong before soldering!

No doubt you can add many other examples of the superstitions and tabus that hem in amateur radio. Our child-like faith in these beliefs is downright touching! Nobody dares to question or to check. It was less than a thousand years ago that every doctor, every scientest in Europe *knew* that a woman menstruated only in the full of the moon. Don't laugh! We still blindly accept many such contentions. And we, just like our ancestors of a thousand years ago, never dream of being so bold as to raise a question.

. . .W5JJ

Reprinted from "Collector and Emitter"

Bill Hoisington K1CLL

Making It Small

The first of a series on pocket size rigs, using ICs throughout, including the front end.

This article concerns subminiature techniques and methods for building home brew Two Meter FM receivers, transmitters, and transceivers. A complete, I.C., double compound (two cascodes in cascade) rf amplifier at 147 MHz is detailed in this article as an example, which is only 2¼ long, ¼ wide, and 3/8 high, in inches.

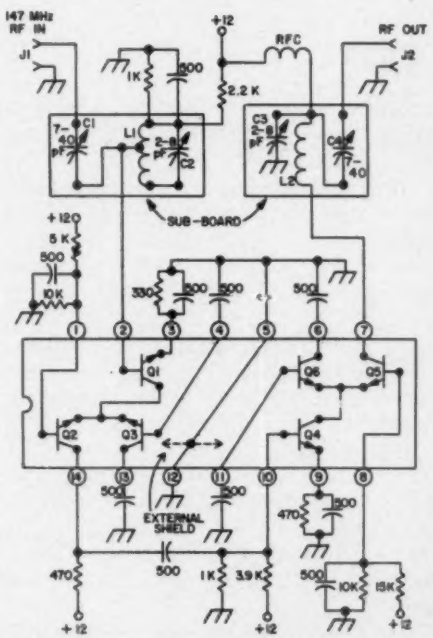
What this will mean to you. This subminiature work is not easy, so look it over carefully before starting. You will need either good eyesight, or magnifying glasses if you are my age. (69). You will also have to order almost all new components, such as 1/8 watt resistors, capacitors 1/8' by 1/8" by 1/16th, an I.C. with six 1gHz transistors in it, ceramic trimmers 2/10ths of an inch in diameter, subminiature wire and solder, and a good "tiny-iron." Then you can start, if you can also wind coils 3/32 of an inch in diameter!

It is my intention to present a series of articles on this subject, rf stages, front end, and a single conversion if strip, all subminiature. Examples will be shown on 220 and 450 mHz also.

The I.C.

As usual, through the decades since well before WW2, when screen-grid tubes became available, it has been mainly through the development by the BC industry with their millions of customers, on into transistors with hundreds of millions of "radios" now being made all over the world, that we now come into the second major revolution, the integrated circuit, or I.C. When an 80 transistor HI-FI FM set can be photographically reproduced and put into a tiny plastic package and sold for $2.54 (quantity lots) there is no longer any possibility of competition, so let's join 'em instead of fighting 'em.

The I.C. being used in this article is the RCA CA3102E, certainly a definite rf milestone in I.C.'s, because it has six 1gHz transistors inside it's shiny black carapace. Furthermore, these are arranged in the 14



NOTES: 1. BE SURE AND NOTE THAT C3 IS SERIES CONNECTED TO L2, NOT SHUNTED.
2. NOTE THE 3.9 K BIAS RESISTOR TO +12, INSTEAD OF 2 K.
3. MORE DETAILS ON FOLLOWING FIGURES.

Fig. 1. Schematic, sub-miniature I.C., double compound RF amplifier, 2m FM.

pin package so that either of the two compound amplifiers may be used in the cascode mode, or the dif amp mode. And still further, they have gone to considerable lengths to separate and isolate these two amplifiers, one from the other, so that they can be put in cascade (not cascode), without self-oscillation. The result here, along with subminiature components, is a double-compound rf amplifier with a lot of gain in a space 2¼ long by ¾ wide by 3/8 high, in inches. With modules like this you begin to get the feel for the size of a complete set in a hand-held package.

The complete circuit of this subminiature rf amplifier using the RCA CA3102E is shown in Fig. 1, with layout pictorials following, as half the work involved in placement of the components. Perhaps I should even say *finding* a place for them. The circuit itself is similar to one previously published (in 73, of course) which however was not miniaturized. So the main deal is on how to "Make It Small." Note the use of the two compound amplifiers cascaded, both in the cascode mode. Note also that the near similarity of these words does *not* mean they are the same. The CA3102E may also be used in the dif amp mode but that is another story. The rule is, dif amps for large signals and cascades for gain.

How to see what you're doing. I am 69 years old, in "Radio" for over half a century, and have "standard old age vision." This is the inability to read a newspaper without glasses, but with which (the old age vision) I can see a good looking girl 100 yards away! Does this stop me from making tapped coils 3/32 in diameter? No, because I have two pairs of *magnifying* glasses, one for reading small print, and the other pair, about times two, for micro-transistor work. And believe me, they are vastly superior to those big clusmy 12" O.D. magnifiers that you have to look through and are mounted like a lamp, between you and the tiny board you are going to work on. These eyeglasses are old now, so they have been an excellent investment in my electronic career. With the "times two" pair I can see smaller things and work with them better than the average lad in his twenties. I told you this project is not easy!

Resistors

Several companies have been making good 1/10th and/or 1/8th watt resistors for 20 years that I know of, because I used to use them in pocket rigs with tubes in the early fifties. These little bits of carbon are still good after 20 years, and are almost as easy to work with as the ¼ watters. They are small though, being only .145 long by .062 in diameter. All that I have obtained, and I use mostly Allen-Bradley, are from Cramer Electronics, Inc., 85 Wells Av., Newton, Mass. 02159, Tel. 617-969-7700. They ship C.O.D. also. Get their catalog *first*. You can read the ohmage on these tiny things just like their big brothers, so they will not be wasted, even if you don't get to build the whole set.

Capacitors

The only reasonably priced source I have at present for small bypass capacitors is Radio Lafayette. Their little gems, 1/8th by 1/8th by 1/16th, listed on page 272 of their 1973 catalog, do the job, even up to the 450 MHz, if you use them correctly. Radio Lafayette's latest name is "Lafayette Radio Electronics, 111 Jericho Turnpike, Syosset, L.I., N.Y. 11791. Tel. 516-921-7500 for their "Shop-by-Phone" service.

When using these items you have to proceed carefully with the soldering. They are good, they last decades that I know about, and they measure correctly on a capacitance meter, but you must use a tiny iron and only for about a second. You will *soon* find out just how long you can apply just so much heat! Order extras the first time! I use an American Beauty Iron, Cat. No. 3118 SCP, 30 watts, with a piece of No. 10 or 12 copper wire as the tip, and file it down to about a 45 degree slant. And keep it filed and super-clean and bright-tinned. Tin it immediately after filing (less than one second for best tinning) and shake off extra solder. Do not tin those little baby caps beforehand! And do not use anything bigger than a 30 watter. Certainly not one of those brutal "soldering guns." Pre-form the leads as much as possible before soldering, and don't be afraid of them. I don't lose more than about one in fifty now.

Wire

There isn't much wire in the example circuit in this project, mainly the plus volt leads. Do not use anything larger than sub-miniature #30, stranded. I have some with Teflon insulation, "left-over" from some military project of a dozen years ago, and it is tough to work with. They *have* to use it, and they have *our* dollars to spend on it, which I don't begrudge them at all, but you will find it very difficult to strip. At least I do. Ordinary plastic covered #30 stranded is good enough for this work, because you're not going to apply prolonged heat anyway.

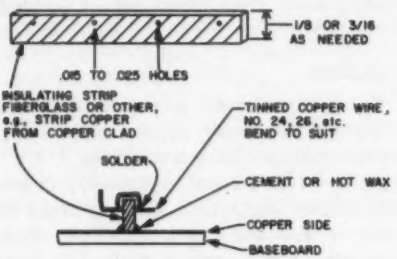

1/8 OR 3/16 AS NEEDED
.015 TO .025 HOLES
INSULATING STRIP FIBERGLASS OR OTHER, e.g., STRIP COPPER FROM COPPER CLAD
TINNED COPPER WIRE, NO. 24, 26, etc. BEND TO SUIT
SOLDER
CEMENT OR HOT WAX
COPPER SIDE
BASEBOARD

Fig. 2. The points.

Tie Points

Fig. 2 shows a method that you can use for almost any size wire you can see and any size hole you can drill. I have used common pins of .021 diameter hammered into and through .020 holes, but the method of Fig. 2 is adequate for the strips shown in that figure.

Tools

A jeweller's hack saw is useful and is a very good tool to have around in any case. One with a large number of teeth per inch, like 32, or even more is best and with such a saw you can cut the strip shown in Fig. 2 out of the insulating material of a sheet of copper-clad if you do not have thin fiberglass or epoxy sheet on hand. The sheet I used happens to be .030 thick when the copper is stripped off. I used a knife to start the copper off for stripping and then strong pliers and peeled the rest. Do it slowly, and watch your fingers!

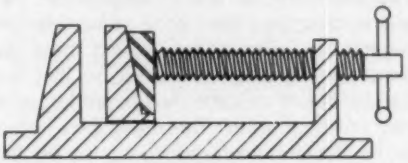


Fig. 2b. Outline, drill vise.

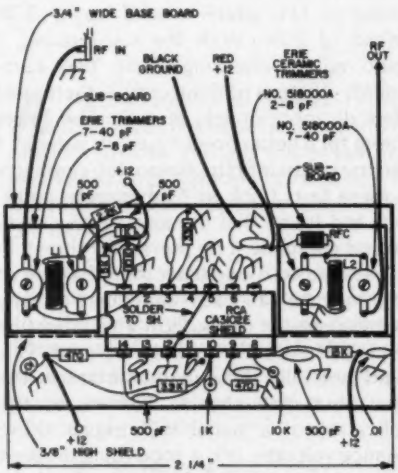
I have a Black and Decker ¼ inch drill with their drill stand, which is very useful in this work. You have to get a jeweller's chuck to handle those little #60 to #80 drills. As mentioned, you cannot get very far into subminiaturization without special tools. I use various kinds of small tweezers, small screwdrivers filed into different kinds of points, jewellers pliers and cutters galore, very small files, and several box frames 4 to 6 inches high to bring the work up near your eyes for use with the magnifying glasses. Also masking tape to hold the small baseboards down on the box, #22 five core solder, a separate small iron for the hot wax, a good micrometer, and a good but small drill vise (in fact, two sizes of these). Just in case you haven't met this handy item, Fig. 2B shows an outline. Very handy also for soldering plugs, jacks, and all sorts of small work. "A good workman is known by his tools."

Steel measuring rules and miniature T squares help also. With the items on this list you can at least make a start.

Tuning Elements

Not having found any tuneable coils of 3/32 diameter at a reasonable price, I went to small ceramic trimmers. And found they were not obtainable at a reasonable price either! This is mainly due to the difference between "radio" components and military ones, and the fact that certain special small parts such as ceramic trimmers, are not made in sufficient quantity (millions) to get the price down to where us amateurs can buy lots of them. Also, radio parts only have to last long enough to get out of the retailer's store, while the military ones have to last long enough to become obsolete, which

is not the same thing. And some suppliers, as you probably know through experience by now, do not differentiate between these two grades unless you insist. The Erie Co., 644 West 12th St., Erie, Pa., Tel. 814-453-5611, makes ceramic trimmers which are small, part #518, 2.5-9. The 2.5-9 refers to the minimum and maximum pF, which works well at 147MHz. The price is a horrible $4.95 (per one ea.) which sounds like a top military price to me, and is for those, which are only .218 in diameter. For a diameter of .375 you only pay $1.97 (by onesies). You can see from this where subminiaturization will lead you, dollar-wise! However, don't think you can inexpensively avoid tuning. I do know how to do it (another "breakthrough" article coming up if lucky) but that one is a *lot more* expensive! Believe me, when, and if, I find a way to do it at a reasonable price, I will certainly tell you right away.



NOTE: 1. ALL RESISTORS HAVE SQUARE ENDS. CAPACITORS HAVE ROUNDED ENDS.
2. ALL 3028E PIN BYPASS CAPS ARE 500 pF.

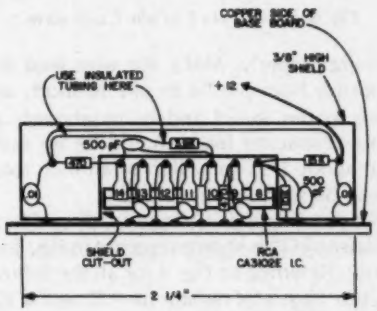
Fig. 3. Layout, rf amp, top view. Scale approx. 2 to 1.

Coils

Very little to say here because this is one of the easier things you have to do. I just took a piece of spaghetti 3/32 in diameter and wound on some turns of #34 DCC (double cotton covered. Enamel will do.) and that was it. Of course, there might be some slight widening of the selectivity curve skirts at rf, but probably not even noticeable. And the gain was very close to the larger coils generally used.

Layout

Here we get into some of the real nitty-gritty work. Fig. 3 shows a top view of the double-compound amplifier of Fig. 1, for Two Meter FM. You will have to work hard at this one. I'm just assuming however, that if I can do it at 69, so can you at N years old. Figure 4 shows the pin 8 to pin 14 detail for that side, and Fig. 5 shows the pin 1 to pin 7 side. I put in all the bypass capacitors first, then the resistors to ground, then the +12 resistors.



NOTE: ALL PIN BYPASS CAPACITORS ARE 500 pF.

Fig. 4. Layout, pin 8 to pin 14 side. Side view.

The two sub-boards each contain two trimmers, one coil, and six tie-points, as seen in Fig. 3. These can be assembled and wired before or after cementing in place. If you use the common pin method be sure and put insulation, 005 mica or fiberglass, or good linen base bakelite (phenolic) sheet between the sub-boards and the copperclad baseboard, to prevent the pinheads from shorting to ground. Use high-Q coil cement, or hot wax if it is an experimental job like all mine are. If you use the tie-point method of Fig. 2, you do need the insulating sheet. I also use hot wax to keep the +12 lead in place along the shield, or along the baseboard. As I look at it here on the working model, there is only about 4 inches total of it. I used #30 plastic covered subminiature wire.

Leads and wire dress. The base input lead from pin 2 to the tap on L1 should be carefully routed around C1 and kept short. That is about the only rf lead of any length in the whole layout. In my working model here that lead is only 5/8 inch long. Check also with the next paragraph, which has pin detail, and dc voltage readings when

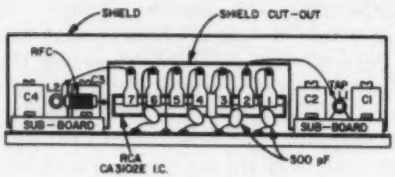


Fig. 5. Layout, pin 1 to pin 7, side view.

running properly. Make the wire lead and capacitor from pin 14 to pin 10 short, and close to the shield and/or baseboard. All bypass capacitor leads should be no more than about 1/32 to 1/16th of an inch long, as can be seen in Figs. 4 and 5.

Pin detail and dc voltage reading. Pin 1, the base of Q2 is shown separate in Fig. 3 for clarity. Referring to Fig. 1 for all the following, pin 1 has a 5K resistor to +12 and a 10K to ground as a voltage divider. On a VTVM I find 7 volts dc. Pin 2 is the base and rf input to Q1, with a 2.2K to 1K voltage divider, and 3.4 volts. Pin 3 is the emitter of Q1, 1K to ground, and 2.5 volts dc. Pin 4 is not used but is bypassed. 0 volts. Pin 5 is grounded to the baseboard and has a crossover wire to pin 12, and is also soldered to the shield. Pin 6 is the collector of Q6 and is not used, but is bypassed. 0 volts. Pin 7 is the collector of Q5, and is the rf output pin. 12 volts.

Pin 8 is the base of Q5, biased and bypassed. 10K to ground and 15K to +12. 4.1 volts. Pin 9 is the emitter of Q4. It is bypassed and has a 470 ohm resistor to ground. 1.6 volts. Pin 10 is a very important one, the base of Q4, and is the input to the second cascode amplifier, with 1K to ground and 2K to the +12. Has 2.3 volts dc on it.

Pin 11 is bypassed and not used. 0 volts. Pin 12 is an internal shield and is grounded to baseboard, and to the shield by the crossover strap to pin 5. 0 volts.

Pin 13 is the collector of Q3, not used but bypassed. 0 volts. Pin 14 is the output collector of Q2, in the first cascode amplifier. 10 volts dc.

Testing

For almost all receiver work, a pair of 6 volt "lantern batteries" do quite well on the bench. I always have several sets of these around, with a switch and 100 mil meter in series. On applying 12 volts the CA3102E, biased for best operation, will show between 20 and 25 mils total. Looking at Fig. 1, one would expect that there would be a certain balance of current in each of the compound amplifiers. That is, the total current depends on the two base bias voltages plus the emitter self bias of Q4 and Q1. The values shown are for maximum gain, plus stable operation with no feedback showing, or any trace of self oscillation. A slight variation may be found in the final emitter resistor of Q1 and in the voltage divider of Q1, which wound up as 3.9K instead of 2.2K. With the rig running, I would advise checking these two components. There is nothing critical there, just a few db more or less of gain. Use lower current for a better noise figure, in general. I used my trusty infinite-attenuator-generator on these tests (look in 73 magazine naturally!) and found that the gain of this small coil and component rig previously shown in 73. Use a tuned diode detector to be sure of the frequency, and also that there is only one frequency in the output! This would be the case where self-oscillation existed. This would generally show up as current in the ouput, but not always. Sometimes the application of a signal will trigger those nuisance voltages. It is a good thing to *listen* to the output also by means of an af amplifier plugged in on the diode output.

Conclusion. A subminiature I.C. double compound amplifier, that is, two cascodes in series, for use as an rf amplifier for Two Meter FM with minute detail on obtaining and using small components. Further articles, on subminiature front ends and single conversion if sections may appear later in 73. Keep reading, of course.

. . . *K1CLL*

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Easy-Way TOWER

A recent survey of towers disclosed that prices began at fantastic and then ranged upwards! Perhaps this is one factor that keeps large numbers of amateurs from putting their beams up there where they do the most good.

One tower material that hasn't been adequately explored is that electrical standby—thinwall steel tubing—otherwise known as EMT. This material is cheap, light, strong, galvanized, and easily worked. It's price makes it an attractive tower construction medium.

In the "Thinking about a tower" days, all kinds of questions arose, such as: What shear and compression forces are involved? What bending moments are acting on a section? What icing load will it stand? Not having access to much tower design information, I proceeded to weld (braze) up a ten foot section. See Fig. 1. Placing saw horses under the ends and sitting 300 pounds of people-weight on the center of the span hardly caused it to sag!! This empirical experimentation convinced me this was strong enough for amateur use. Other desirable features on my list included: (A) light-weight construction, (B)

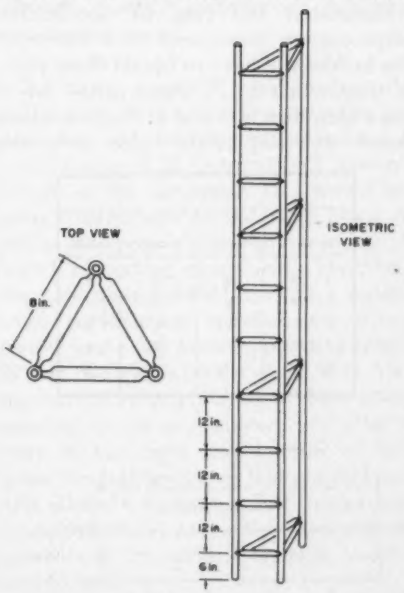


Fig. 1. Basic Building Block.

safe to climb, (C) a built in ladder, (D) reasonable cost.

The exact cost of building a tower depends on several variables, many readers know how to weld (braze), and have access to the required equipment. Others have a brother-in-law or friend who can be called upon to do the job. If not, the services of the local garage or metal working shop can be sought.

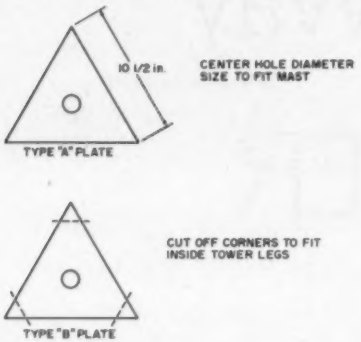


Fig. 2. Plate.

Metal Work

Fortunately this type of construction keeps outside metal work to a minimum. The builder will have to obtain three plates as shown in Fig. 2. These plates are of one-eighth inch iron and of the dimensions shown. Referring to the Table, determine the necessary number of connector plugs for your desired tower height. These connector plugs are made from ten inch lengths of ½ inch water pipe. See Fig. 3. The outside diameter of this pipe is slightly too large to slip into the tower leg tubing. Chuck the connector plug section of pipe in a lathe and take a cut each way from center as shown. Leaving the shoulder in the center of the plug keeps it centered when you join two legs together. Tower sections are joined by drilling through the tubing with plug inserted, and bolting with ¼ inch galvanized stove bolts. Use two per tower leg.

TABLE "A"

number of sections	spacers	EMT lengths	plugs
1 – 10'	18	3	0
2 – 20'	36	6	3
3 – 30'	54	9	6
4 – 40'	90	12	9
5 – 50'	144	15	12

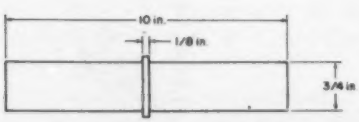


Fig. 3. Connector Plug.

Basic Building Block

Fig. 1, is a drawing of the building block tower section. It requires three (3) ten foot lengths of EMT, and 18 spacers each eight inches long. After cutting the spacers to length, grip the last ¾ inch of the spacer in a vise and crush the ends *almost* flat. Use care to position each end of the spacer for crushing so that the flat ends are parallel. This permits snug fitting of the spacer against the tower leg for welding. A couple of trials and you'll produce perfectly formed spacers every time.

Now, with a felt tip pen, mark 2 of the ten foot lengths of EMT at a point 6 inches up from the end, and each 12 inches thereafter. These marks will indicate the center of each rung for the ladder side of the tower. A simple jig for holding everything in alignment is shown in Fig. 4a. It consists of 3 pieces of scrap 2x4 lumber, each piece about 14 inches long and bored for 1 inch diameter holes, spaced on 9 inch centers. (Make 4, as the extra jig will be used later to hold the third leg.)

Slip the ends of the previously marked EMY tubes through the end pieces and "runner," of the jig. With a carpenter's square position the tubes so that the ends are in square alignment. Weld the first rung. The "runner" is slid along the tubing just ahead of the rung being welded. It helps to keep everything rigid during the brazing process. Choose a fairly level place to work. I welded my sections on my concrete driveway.

When the ladder section is finished, slip a jig piece over each leg of the two ends of the ladder section, (see Fig. 4b) and thread the third length of EMT through both free holes at each end. This positions the third leg for welding the spacers between it and the ladder section. As can be seen from Fig. 1, the spacers are placed at the first, fourth, seventh and tenth rungs. This now completes a section of the basic building block. As many as are required can be fabricated. Construction will be speeded up if all connector plugs were prepared before welding began. When the first section is finished, insert the connector plugs and use

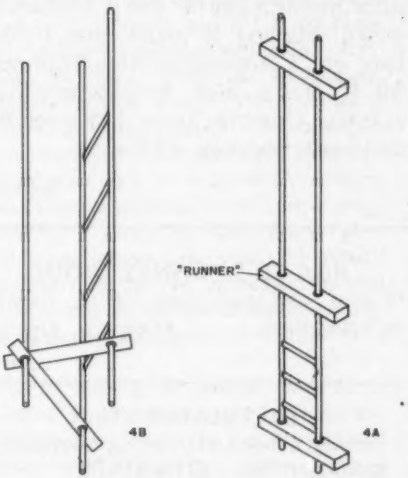


Fig. 4. Ladder.

the finished section as the jig for one end of the new section being built. This speeds things up considerably.

Top and Bottom Plates

When the desired length of tower has been fabricated, the tower is finished by the addition of a type "A" plate welded to each end. A type "B," lateral thrust plate, is welded three and one half feet down from the top plate. This positions it atop the second set of spacers.

Erection

Due to the light weight of this type construction, erection is easy compared with many other types. For a 40 or 50 foot tower, a couple of men on the guy wires will allow one man to walk it up. Three guy wires should be attached. With two people holding the forward guy wires, and the 3rd guy wire (the one that's behind the man walking the tower up) temporarily anchored —the tower can be raised with safety. I usually drive a 6 foot ground rod (½ inch water pipe) at the center of the tower location, leaving 4 inches protruding from the earth. By fitting this stub of pipe into the hole in the base plate as the tower is started up, it will solidly anchor the tower base. After the tower is in place, a ground strap is connected from the tower leg to the earth rod for lightning protection.

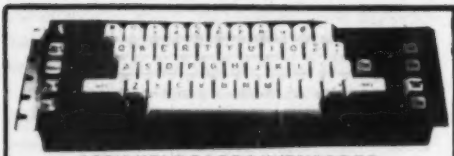
Durability

After completing the tower, wire brush and inspect all the brass to steel welds, and touch up any that may require it. Then wash thoroughly with a bucket of warm detergent. When dry paint with a good grade of aluminum fence paint. With these precautions, your tower will last indefinitely.

The last trip up for inspection was in 1972, and my 190 pounds felt perfectly safe although minimal maintenance has been taken on this tower.

The tallest tower of this type that I've built was a 90 footer. This monster was erected in one complete length using a 20 foot gin pole. A 20 foot length of pipe was hoisted to the top and a 32 element two meter array brought up and put in place. All that beam weight along with my (then) 150 pounds proved my experimental hypothesis about the ability of EMT to make a suitable tower construction material. My friend, W4EW, had a 100 footer supporting several six and two meter beams along with his 4 bay conical TV antenna. Six of these towers were/are in use in Alabama, and after 10 years of use, none that I know of have failed. Several hurricanes that played havoc with other TV type masts left these towers unscathed. If you want a light strong tower, and have a flat wallet, this type tower is hard to beat.

. . . W4VUO/3



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NEW 96 PAGE CATALOG NOW READY

Bill Hoisington K1CLL

LOW-COST INFINITE ATTENUATOR FOR AMATEUR USE

One of the most useful test-equipment gadgets the homebrewer can build is a signal generator. The one described here is of commercial quality and it can be completely contained inside a waveguide. Positioning, by sliding along the waveguide, provides a variable-strength stable signal of one millivolt, one microvolt, one nanovolt, or less, dropping down gradually to a true zero. It does this in a perfectly smooth fashion without steps or jumps so that every fraction of a decibel in lower noise figure shows immediately on the slide dial. What's more, the slide can be calibrated so that FM'ers can use the device for directly measuring receiver sensitivity in tenths of a microvolt.

In building a 6 meter receiver recently for maximum absolute sensitivity I naturally had to check especially on the first-stage rf transistor and circuit for minimum noise figure. (For this type of work you *must* have a signal generator capable of being attenuated out of sight with any receiver you can buy for any money.) The usual generators on the market under $100 do not do this. And many of the very expensive generators get so leaky that they have to be used 200 ft. from the receiver. At any rate, the generator described here can be made up quickly and at low cost, and it *is* stable, reliable, and infinitely variable.

Waveguide

The only possible difficulty might be in obtaining the piece of waveguide needed. The piece I used is 4½ in. wide by 2 1/8 in. high, and is 24 in. long. If you have a choice, get a piece a little longer. You could make up this item out of brass or copper if you had to, because in this case it is not used to *carry* energy but to *attenuate* it, so the worse you make it the better!

The waveguide *must not* have any holes in it and should be reasonably smooth inside because otherwise your dial would not read smoothly in attenuation. You *could* use copper or aluminum drain pipe, although I have not tried them yet. Working directly on rf, this attenuator is good for any kind of modulation, including SSB, FM, Pulse, or what have you.

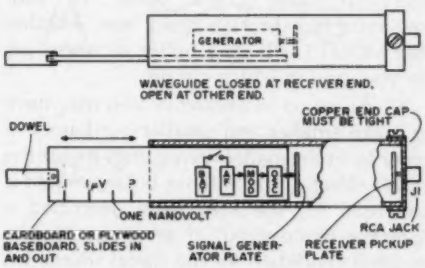

Fig. 1.

Construction

Fig. 1 shows the basic idea. When the signal generator plate is close to the receiver pickup plate, you can get about 100 mV of signal into the receiver, and it is handy for checking diode receivers. When the two plates are about 8 in. apart, the signal is just detectable on a good receiver. Additional spacing between plates amounts to "waveguide beyond cutoff." I do not believe that there is any receiver in the world that can

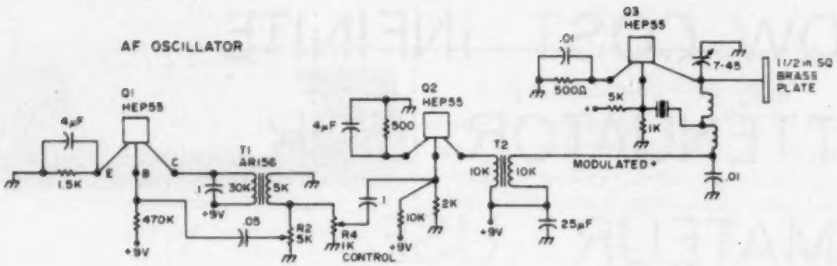

Fig. 2. Schematic of Generator

pick up the signal much beyond the 8¾ in. point.

Pretty soon in your receiver "peaking" work you get to that signal that may be but a tenth of a microvolt or so, and you begin dreaming about cryogenic front ends, masers, and such. As mentioned, every fraction of a decibel lower in noise figure, every improvement in sensitivity comes out rigorously and relentlessly on that slide dial. You can easily check which of your low-noise transistors is really low, whether that MOSFET will do a better or worse job for you, and in which circuit.

As you go up in frequency you may have to make smaller and smaller oscillators in order to fit in smaller waveguides to get the cutoff effect. (That will not be a problem if you read 73; the May issue described a "postage-stamp-sized" rf generator that is an ideal candidate for the signal source.)

Circuit

A crystal oscillator, an af oscillator, and a simple class A modulator do an excellent job to start with. Fig. 2 shows the present unit as used on 6 meters. It must be stressed again that no wire or other piece of metal may be allowed to reach the outside from this assembly. I'm making up another for 2 meters soon (still my favorite band) and will try one on 450 a little later.

Audio

A controlled-feedback transformer-coupled af oscillator does a good job in furnishing a sine wave. A Motorola HEP55 is used for the oscillator, with feedback to the base from the collector through transformer T1, controlled by resistor R2. Audio output is taken off the 5kΩ winding of T1, is fed through R4 the modulation control, and then to the base of af modulator Q2. Transistor Q2 is set up for low-power class A operation because not much modulation is needed for the signal generator. Transformer T2 is an old 5W unit from "tube-type portable" days. The secondary of T2 feeds a modulated +9V signal to Q3, the crystal-controlled 50 MHz oscillator.

This rf oscillator is one of my negative-feedback jobs with phase reversal in the crystal. A 1½ in. square plate is tied onto the collector, radiating energy to the receiver pickup plate facing it inside the waveguide. This energy is rapidly attenuated as you move the plates apart, and should be impossible to detect after some 9 or 10 in. of separation.

Once again, do *not* bring any wires or any other metal or conductor out from the oscillator assembly. If you want an outside controlled switch or other control, bring it out as a wooden dowel handle.

That's about it. Tune everything up outside the waveguide on the bench and when you're satisfied, plug your best 6 meter receiver into J1, push the oscillator plank along the waveguide (or rather I should say pull it along) away from J1. You'll get a surprise! Hope this helps you with your low-noise receiver work. It did a lot for me.

. . . *K1CLL*

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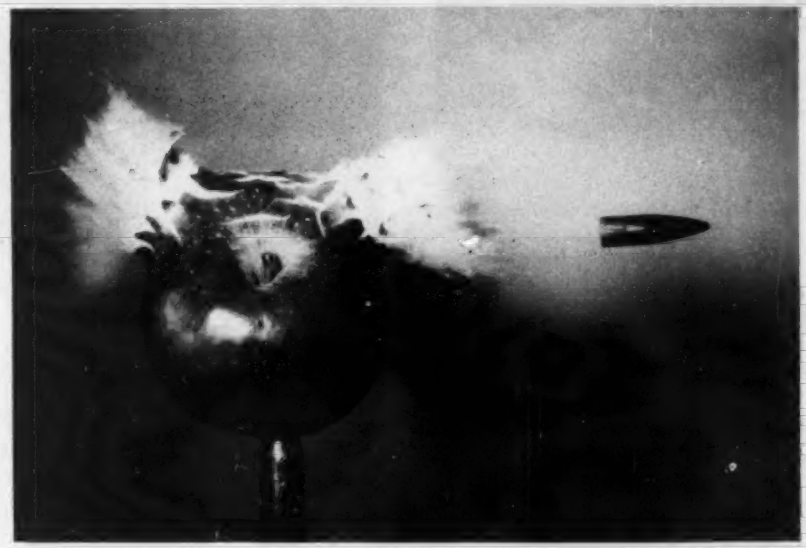


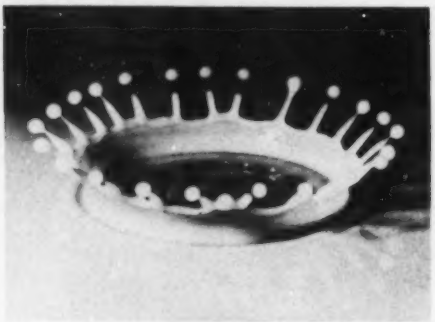
Lightning In A Bottle

flashtubes

Electronic flash has long since come into its own with a wide variety of applications ranging from photography to theatrics. In spite of its wide range of exploitation, however, it seems to have attracted relatively little interest to the experimenter. Considering the simplicity of the circuitry, it is something of a shame that this field is so neglected.

Whether taking a picture, activating a ruby laser, or freezing motion, the principle and circuit is basically the same. The lamp itself consists of a glass or quartz tube filled with a rare gas. In photographic applications, the gas is usually xenon, which produces a spectrum approximating that of daylight. The tube is connected across a large capacitor which is charged to a high voltage. When a high voltage pulse is applied to a triggering electrode – a conductor in close proximity with the lamp envelope – the gas inside ionizes. Upon ionizing, the resistance of the gas drops to almost a short circuit and the capacitor discharges producing a brilliant flash of light.

The power consumed by a flashtube is usually measured in watt-seconds – the number of watts drawn by the load times the number of seconds the lamp is lit. The average amateur flash unit runs about 25 watt-seconds. This may seem small until you



Milk drop making crown effect.

consider the flash only lasts about 250 microseconds. A 25 watt-second lamp, if it burned steadily, would consume 100,000 watts! You don't believe it? Okay. Here's where I got the number. 250 microseconds equals 1/4000 seconds. To deliver 25 watt-seconds in that amount of time, the instantaneous power consumption must be 25 x 4000 or 100,000 watts!

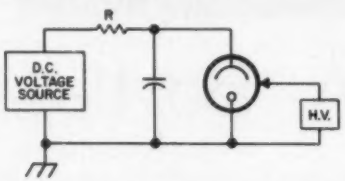


Fig. 1. Basic flashtube circuit. Generally, the dc voltage is in the order of 400 to 1000 volts in photographic units. The high voltage triggering impulse averages around 4 to 5 kV. The triggering electrode is in the form of a thin wire wrapped around the outside of the tube. In some photoflash units, the reflector also serves as the triggering electrode. Resistor R presents overloading of the dc supply as the capacitor recharges, and delays recharging of the capacitor long enough to let the lamp cool.

The amount of light delivered by the lamp, however, is a different matter. It depends not only on the power consumed by the lamp, but on the form factor of the lamp and the type of reflector used. The intensity of the light in the center of the beam, expressed in candle power, is multiplied by the duration to give a figure called beam candle power seconds. This figure, which is an accurate expression of the quantity of light, is what the photographer needs to properly expose his film. Amateur units average around 1,000 BCPS. A thousand beam candle power seconds crowded into 250 microseconds has an instantaneous brilliance of four million candle power!

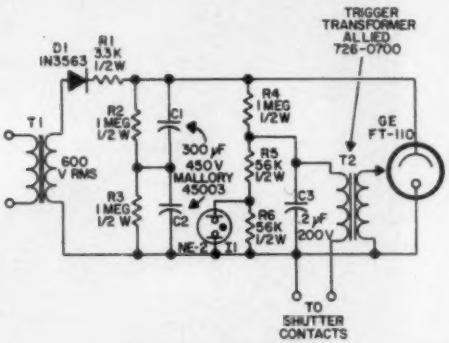


Fig. 2. Here is a workable 100 watt-second photoflash unit. It uses the ac supply, and the mallory capacitors are monsters in size. Selection of newer type capacitors and replacing the transformer T_1 with a solid-state chopper circuit will result in a more nearly up-to-date battery-powered unit.

As mentioned earlier, the circuit is very basic. The anode voltage for the lamp is provided either from the ac supply or from a battery through a transistor chopper circuit by a simple half wave rectifier. The triggering pulse is usually provided by discharging a capacitor through a small transformer not too much unlike the flyback transformer used in TV applications. A resistor in series with the diode limits the capacitor recharging current to within the ratings of the diode.

The watt-second rating of a flashtube circuit is determined by the combination of voltage and capacitance, using the formula

$$J\ (\text{Watt-Seconds}) = \tfrac{1}{2} E^2 C$$

where C is expressed in microfarads and E is expressed in kilovolts. For example, using a capacity of 800 microfarads and 400 volts,

$$J = \tfrac{1}{2} (0.4)^2 \times 800,$$

or

$$\tfrac{1}{2} (0.16 \times 800),$$

or

64 watt-sec.

In the formula, the letter J, which usually stands for joules, represents watt-seconds. A

The Jack of hearts- he had no tarts.

joule is equal to one watt-second. In computing the power, we are actually calculating the energy stored in the capacitor. The term "watt-seconds" is preferred by those who work in the electronic flash-field.

Figure 2 is a diagram of an ac powered flash unit. Although quite operational, its large size puts it into the category of yesteryear. It is, however, about four times as powerful as the small units that fit on top

RADIO SAFETY

A careless technician named Cleever,
Went to work on his FM transceiver.
This unfortunate lug
Failed to pull out the plug,
Leaving his poor XYL a griever.

A DX'er from North Carolina
Thought his antenna couldn't be finer.
Till he looked at the roof
And discovered the goof:
His quad had quashed an airliner!

A dim-witted novice we know
Strung his long-wire somewhat too low.
A neighbor, while joggin'
Lost most of his noggin
Leaving our friend a heady memento.

A curious chap from Tangier
While adjusting his high-powered gear,
Left the cover unsaddled
As he tuned and paddled,
Thus ending his hamming career.

A DX'er with rig over-powered,
Tried to chat on the air as he showered.
He CQ'ed and CQ'ed,
Till quite barbequed;
(Obviously, the tub had to be scoured)

K4ADL

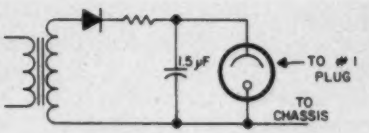
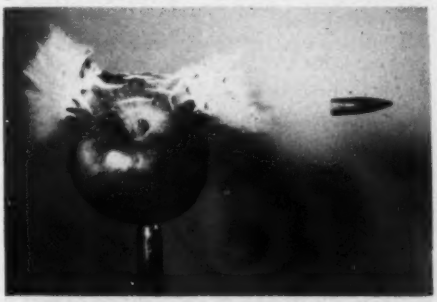


Fig. 3. Reducing the capacity to reduce the watt-seconds enables rapid repetition. Firing the lamp from an automobile's ignition system changes the flash unit to a timing light.

of your camera, and is basic enough to demonstrate the principle. The energy storage capacitors, C_1 and C_2 are connected in series as the maximum available voltage rating in electrolytic capacitors is limited. Resistors R_2 and R_3 equalize the voltage across the capacitors.

All parts to the right of the energy storage capacitors are housed in the flash



High speed camera catches apple passing through bullet.

head. R_4, R_5, and R_6 form a divider to supply the proper voltage to ignition capacitor C_3. As the charge in the energy storage capacitors reaches the proper level, lamp I_1 lights. When the shutter contacts close, C_3 discharges through the primary of T_2, supplying a high-voltage pulse to the ignition electrode to fire the lamp.

Since the action that initiates the ignition process is a contact closure, a wide range of tricks are possible. The contacts need not be in the camera. They can be in a relay, or the circuit can be completed by a thyrotron or solid-state switch. By using a microphone to pick up the report of a gun and triggering the flash from the amplifier output, a bullet can be frozen between the weapon and the target. A photo relay can trigger the flash as a falling drop passes. A little time delay in

the circuit can produce some interesting patterns by freezing the drop as it strikes the surface.

For another application, if the watt-second rating of the lamp is reduced, rapid repetition of the flashes can be done without driving the lamp to self-destruction. By reducing the capacity to within the range of non-electrolytic types, the power of the unit can be reduced to one watt-second. Now, if the triggering coil and associated parts are eliminated, and the ignition electrode connected to the No.1 spark plug of an automobile engine, the unit becomes a timing light. The lamp fires each time the plug fires, freezing the motion of the flywheel so that the timing mark can be seen. Enough said if you are an automobile bug.

With the lamp's energy reduced to permit rapid firing, we find another application. By running the output of a tunable sawtooth wave generator through a flyback transformer and using the resulting power to fire the lamp, we have a calibrated rate of flashing which is useful either for stroboscopic timing or to blow the mind psychedelically. I must admit here that my strongest point with flashtubes is in single-flash applications such a photoflash or laser applications. If you want to build a strobe light, you will need to experiment to find the best type of flyback transformer to ensure that you have the proper voltage for your lamp. The principle, however, is as represented here. For extremely fast operation, you may need to select your lamp from several. I've been informed that stroboscope manufacturers make their own lamps. G-E, however, has several that are specifically recommended. Namely, FT-230, FT-151, FT-524, and FT-91. Having presented the principle, I leave the rest up to you.

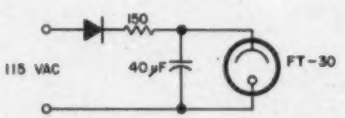


Fig. 4. However, G-E recommends the FT-30 for this purpose. Since this lamp operates at a much lower voltage, the circuit is much simpler, but the flash is longer in duration.

The theatrical, or psychedelic application is the most recently popularized and one of the most publicized use of a rapid-repeating flash unit. Generally, the same type of unit is used in this application as in scientific applications, the repetition rates being adjusted to the individual user's taste. You may find a rate somewhere between ten and fifteen flashes per second most effective, as there is a point within that range that will interfere slightly with brain impulses and drive you right up a wall. It isn't dangerous unless you overdo it though.

Whatever your favorite application, there is, in the relatively simple circuitry of the electronic flashtube, a vast potential for many a fascinating evening. I will add one precautionary note for any beginner working with large capacitors charged to a high voltage. If you get across a fully-charged capacitor, it can kill you. Careful!

... W2FEZ

Books:
General Electric Flashtube Data Manual
Flashtube Engineering Manual (Allied cat. No.726-0100)
The Way Things Work Simon & Schuster, New York
Professional Photographic Catalog

PARTIAL LIST OF FLASHTUBES

TYPE	Max. anode voltage	Max. watt-sec. input	Min. flash voltage	Trigger pulse
G.E.				
FT-30	500	10	120	10 kV
FT-106	315	50	250	4 kV
FT-110	1050	100	800	4 kV
FT-118	550	125	400	4 kV
FT-218	1050	200	800	4 kV
Honeywell				
AF202001	260	16	210	4 kV
AF202002	360	24	220	4 kV
AF202003	400	28	210	4 kV

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Modernizing The SELECT-O-JECT

Chromed bumpers, padded knobs, emission controls and oh yes, op amps.

Various forms of the select-o-ject have been around for quite awhile. This is device which can either peak or notch a tunable audio frequency. Older versions of this device suffered, however, from a drawback which rendered them somewhat inconvient to use. The gain and the tuned frequency interacted in such a way that a two-handed approach to the beast was necessary, an unhandy trait during the best of contests. The above remarks held for both the vacuum tube versions, and the solid state versions, and for much the same reason, which we shall explore here. This article describes a scheme for putting together a select-o-ject in which the three variables of overall gain, tuned frequency, and notch depth – peak height, are all quite independent. To fully benefit from this article, the reader is strongly urged to review the operational amplifier articles which have appeared in the August 1970 issue of QST.

Fundamental Concepts

The fundamental idea behind the select-o-ject is sound enough. A circuit is contrived which exhibits a frequency-dependent phase shift, such that a shift of 180° occurs at only one (tunable) frequency. If now the unshifted incoming signal is added to the output of the shifter, the device will exhibit a notch at the tuned frequency, the perfection of which depends directly on how well the two amplitudes are matched. On the other hand, should the incoming signal be added in phase to the output of the shifter, the result will be a peak in the response of the device at the tuned frequency, much in the spirit of the "Q-multiplier" concept.

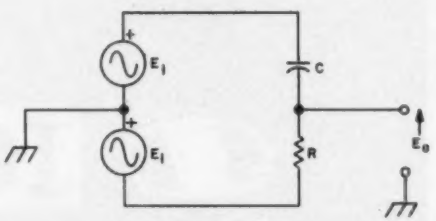

Fig. 1. The basic phase shifter with constant amplitude characteristics.

To understand the source of the difficulty with older versions of the select-o-ject, and to fully understand the operation of the modernized version presented here, we turn our attention to Fig. 1, which shows the basic shifter. It is necessary to have the two sources shown, so that the output is constant in amplitude. The little + signs indicate the relative phasing of the two sources, which are presumed to have zero source impedance. The ouput is unloaded. Under these conditions, the ouput/input characteristic of the circuit is given by:

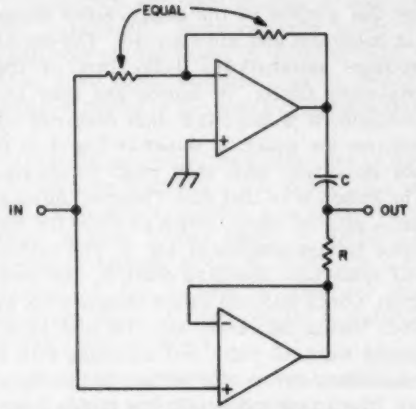

Fig. 2. Showing the implementation of Fig. 1, using operational amplifiers.

$$(1)\ G = \frac{E_o}{E_i} = \frac{x - j}{x + j}$$

$x = \omega RC,\ \omega = 2\pi f$

This is easily derived by those handy with phasor algebra. From equation (1) we can easily list the important traits of the circuit of Fig. 1.:

1) When x is 0, G is 1 at 180°
2) When x is 1, G is 1 at -90°
3) When x is infinite, G is 1 at 0°
4) When x is anything at all, the absolute magnitude of G is unity as advertised.

The conditions of zero source impedance and unloaded output are very important, as any departure from those conditions will upset equation (1) beyond recognition, and completely eliminate the four characteristics listed above.

In older versions of this device, the sources of Fig. 1, were obtained by splitting the incoming signal equally between the plate and cathode, or collector and emitter, as the case may have been. Unfortunately, the requisite load resistors at either end of the active device used, resulted in a non-zero source impedance, and finite output loading. This is the reason for the oddly large values of the resistors which are shown in transistor circuits.

With the advent of low-cost operational amplifiers with pretty close to ideal input-output impedance characteristics, the circuit of Fig. 1, can be approached a good deal more closely, in the real world. Fig. 2, illustrates how this is done. In Fig. 2, and in the rest of this article, all op-amps are drawn in what has become the "standard" orientation, with the inverting input at the top, as indicated by the - sign (the non-inverting input being indicated by a + sign). Power supply connections and dc balancing details are omitted for clarity. Comments on these

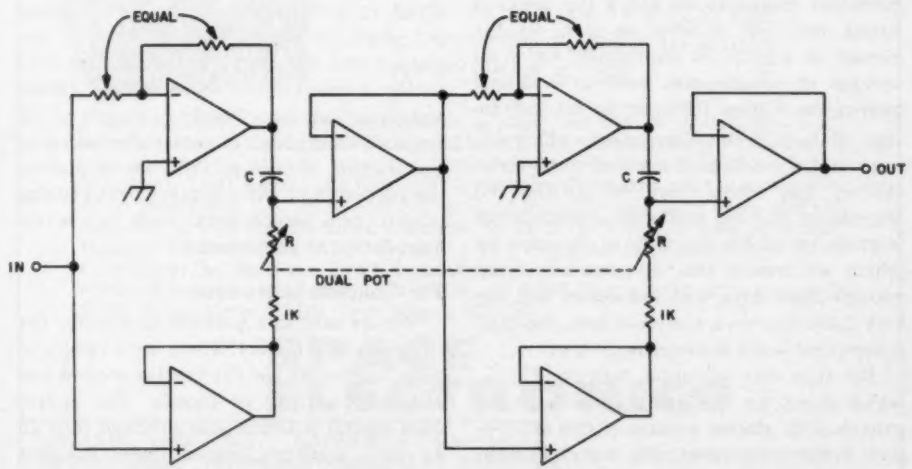

Fig. 3. The phase shifter portion of the modern select-o-ject. Parts values are discussed in the text.

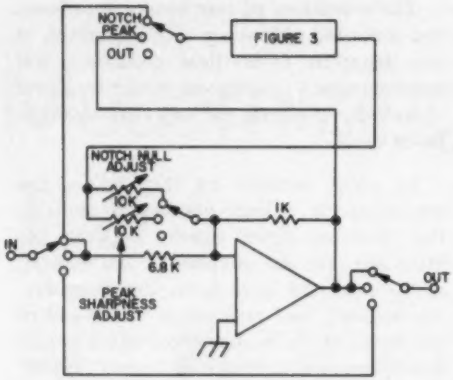

Fig. 4. The complete modern select-o-ject.

two aspects will occur at the end of this article.

Now Fig. 2, will provide a 90° phase shift at the "center frequency" where, from the second of the four traits listed above we can write:

$$x = \omega_0 RC = 1,$$

or:

$$\omega_0 = \frac{1}{RC}$$

The o subscript indicates that this is the particular frequency to which the device is tuned. But 180° is what we seek. So, the circuit of Fig. 2, is duplicated. An extra op-amp is interspersed, used as a simple gain-of-one voltage follower, to take advantage of the high input impedance which will not upset the action of the first stage of the shifter. The reader may be getting the impression that our modernized select-o-ject is going to gobble up scads of op-amps, to which we remark that op-amps are cheap enough these days, and the device will use very little else. As a matter of fact, the total component count is surprizingly low.

We turn our attention then to Fig. 3, which shows the complete schematic for the tunable 180° shifter portion of the select-o-ject. Before proceeding with the application of Fig. 3, to a modern select-o-ject, this would be a good time to discuss part values for this portion of the device. Some things are important and some are not. The use of op-amps automatically takes care of the important matter of source and load impedances. It is important that each pair of resistors are equal, as shown in Fig. 3. It is not important what their exact values are. The reason is so that each "source" op-amp has a gain of unity, which provides for the equal voltage sources of Fig. 1. The author had some 2.2K precision resistors, and used them. Other matched values should work as well. Values betweeen, say, 1K and 100K should work all right, and matching with a good ohmmeter should suffice. In like manner, the exact values of the tuning components, consisting of the two capacitors, and the dual pot, are not important. It is important that the two capacitors be reasonably close in value. The author happened to have a dual 25K pot, and some quick arithmetic with equation (2) showed that values for the two capacitors of 0.1 μF would give a range of tuning of about from 80Hz to 5000Hz. In practice, it turns out that the tuning range is inconveniently compressed at the high end with linear tuning pots. An "audio taper" dual pot would probably present procurement problems and the author did not bother to obtain one. Instead, empirical experience with the device led to a reduction in the values of the Cs to 0.047 μF, which brought the tuning range down to a reasonable "swing" of the dual pot shaft, at the expense of the low frequency end. But then, one seldom has need to use a select-o-ject down around 200Hz and lower anyway. Finally, a couple of 1K resistors were added in series with each dual pot section, as shown. This was to prevent the reduction of the resistance of the tuning pots to zero, which event leads to a severe degradation of performance.

The Complete Select-o-ject

We are now in a position to describe the complete select-o-ject. There are a variety of ways to provide for the feeding around and adding/subtracting of signals. The author tried several schemes, and although they all do have academic interest, only the one finally settled upon will be described here. It is shown in Fig. 4.

A seventh and final op-amp is used for the "combiner" operation. The mode of operation of the device is selected with a four pole, three position selector switch, which is shown in the notch position in Fig. 4.

Initially, provision for a gain control was provided by installing a pot in the place of the 1K feedback resistor around the combiner op-amp. It was found to be an unnecessary feature, however. The audio gain control of the receiver is used for this purpose. Hence, a fixed resistor is installed at this point, as shown.

Also, initially one pot served as both the notch depth and peak sharpness control, but this was found to be most unsatisfactory, since going from one mode to the other required that that control be readjusted, which turned out to be a nuisance. As a matter of fact, in day-to-day use, it is seldom necessary to adjust the notch depth control at all, and if the unit were to be built with this control installed inside, it could be adjusted once and then left alone, a saving of panel clutter would result.

As shown in Fig. 4, one arm of the selector switch is used to select the corresponding adjustment for that mode. When in the notch position, the output of the shifter is added to the incoming signal at the input to the combiner op-amp, and since they are exactly out of phase at the tuned frequency, a notch will be produced there.

In the peaking mode, the incoming signal is applied to the combiner op-amp only, which drives the phase shifter, which in turn provides a signal to be combined with the incoming signal. The phase shifter and the combiner op-amp form a circle in this mode, exactly as is done with the Q-multiplier. Decreasing the value of the corresponding adjustment pot in this mode will progressively sharpen and peak the response, eventually leading to a condition of self-oscillation. It is just before this condition is reached that the device exhibits the maximum sharpness of peak. Of course, one may allow the circuit to oscillate, and use the select-o-ject in "double duty" service as a rough-and-ready source of audio frequencies around the ham shack.

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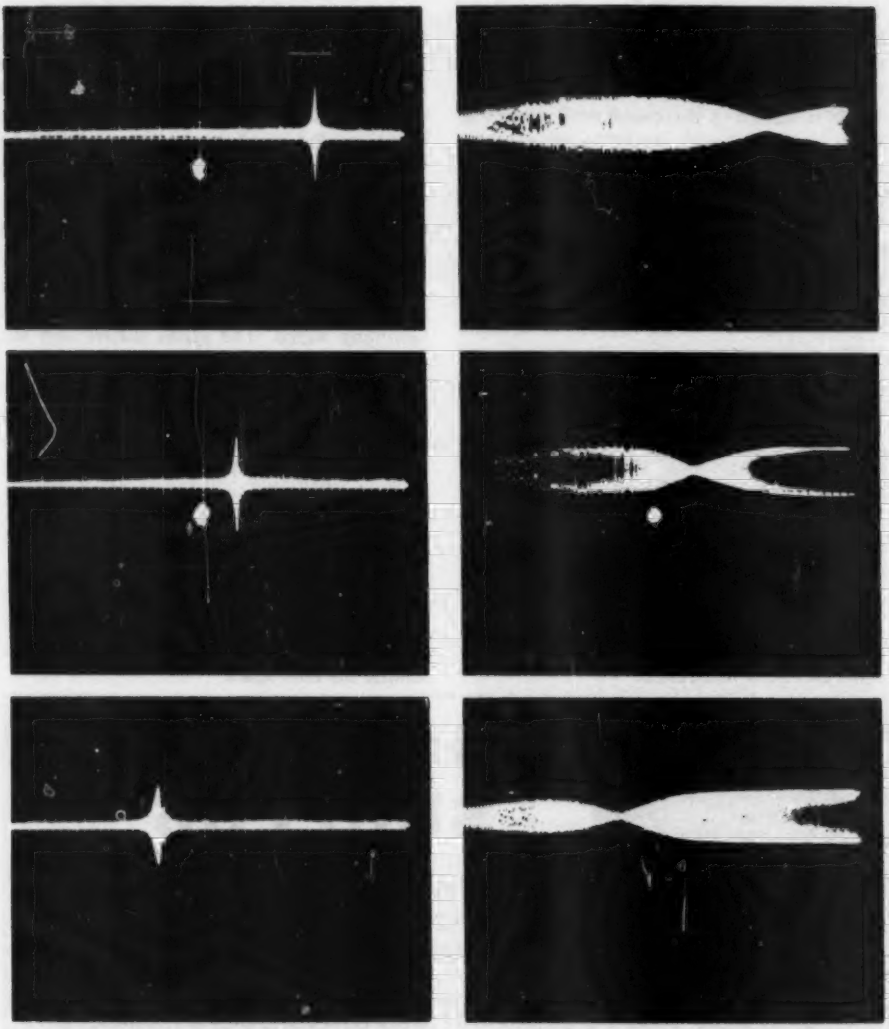

Three pairs of photos taken from a scope showing the output when the unit is switched from Peak to Notch at different frequencies.

In the out mode, the signal is simply routed around the device, as shown.

Operation

The operation of the device is quite straightforward. Plug the input into the headphone jack on the receiver. Place it in the peak mode and advance the peak height control until the device almost oscillates. Swing the tuning pot through its range, and check that the point of "just about to oscillate" on the peaking control does not change. This is the control independence spoken of earlier, and is the outstanding feature of the modern select-o-ject. Now tune in a CW signal and peak it up. Without disturbing the controls, switch the unit over to the notch position. Now adjust the notch control for a null. It will occur at precisely the same point on the tuning adjustment, another of the features which are claimed for this device. If the peaking is first done as

carefully as possible, it will be found that the notch will be capable of completely eliminating the signal. Having made that adjustment of the notching control, again swing the runing control through its range (retuning the receiver in the meantime to provide varying pitches of the applied CW note), and check to be sure that the notch does what it is supposed to do, without further adjustment.

Having accomplished the above, it will be found that operation of the device will consist mainly of doing the tuning. The notch control will not have to be adjusted again, as mentioned earlier, and might as well be mounted inside the unit. The peaking control may be adjusted to suit conditions required. The notch is fairly sharp, and difficulty may be experienced in "finding" it. The easiest way is to peak the unwanted signal first, then switch the unit to the notch mode.

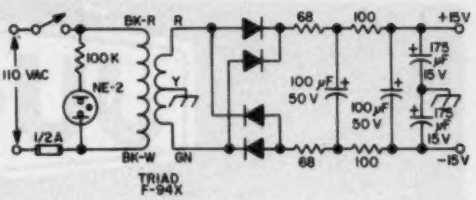

Fig. 5. The power supply for the select-o-ject. The NE-2 pilot light may be an unnecessary frill. The diodes are any convenient rectifiers which have a PIV of about 100V or more, and a forward currant rating of about 100 mA. or more. Good filtering is important, but the exact values of the two output voltages are not, as long as the maximum supply ratings of the op-amps used are not exceeded. A reduction of supply voltages will simply result in a reduction in maximum allowable input signal level. The exact values of the filtering capacitors are not important, the rule here being the more the better. Values shown in the diagram have proven to be adequate.

About Op-Amps

And now a word about op-amps. The author used the Texas Instruments type SN72741N in the "minidip" package, because they happened to be available. This device is quite uncritical, and any reasonable op-amp should do the trick. The reasonable means an input impedance of about a meg-ohm or better, an output impedance of 10 ohms or less, and an open loop gain of at least 50 or so. Any modern op-amp should meet these requirements, at least over the audio range, which is the only range of interest here.

The author is in the habit of using a pair of stereo headphones, mainly because they are comfortable on the ears over prolonged periods of time. They have an impedance of 8 ohms, and are driven directly by Fig. 4, without any need for matching.

Fig. 5, shows the power supply used. The exact current requirements will depend on the particular op-amps used. The drain at plus and minus is 15V, using the SN72741N (seven in all) is about 25 mA from each side of the power supply.

Also shown are some photos taken from a scope, with the select-o-ject driven from an audio sweep generator. The sweep was logarithmic, and covered the span from 50Hz to 5000Hz. In each pair of photos, the device was switched from peak to notch without disturbing the tuning control. One sees that the peak and the notch occur at the same frequency. Reading across the triplet of photos, the frequency was tuned to different parts of the audio spectrum, this time without disturbing the notch and peak controls. One sees that the independence claimed holds very nicely here, there being no need to readjust the peaking as one tunes the device. Truly, "one-knob control." In these photos, the dropping off of amplitude at the left hand (low frequency) end is due to the 1 μF capacitor used to couple in the swept signal, and not due to any dropping of gain of the select-o-ject at low frequencies.

Finally, you may have noticed that no dc balancing has been mentioned. The author found this to be completely unnecessary, at least with the particular op-amps used. If this is a problem with other op-amps, the result will be assymetrical "flat-topping" under conditions of very large input signal. Since there is a dc path around the select-o-ject circuit, should this problem arise, it may be taken care of by returning any one of the grounded op-amp inputs to the center arm of a pot connected between the power supply terminals instead.

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Roy, who was an avid DXer, became a silent key not long ago . . . we thought you might like to read about this enthusiastic and famous amateur in a profile written before his death.

Ham and eggs will not be found on the menu at the famous House of Antoine's in New Orleans, but you will find a "ham" in the person of Roy Alciator, proprietor of this celebrated restaurant.

Roy Alciatore, the grandson of Antoine Alciatore, founder of Antoine's, has been serving famous food to the distinguished gourmets of the world as his father and grandfather had done for more than a century. Presidents, nobility, dignitaries, sports figures, celebrities of stage and screen have enjoyed *Oysters a la Rockefeller, Pompano en Papillotte, Pommes Soufflers,* and *Crepes Suzettes* with *Cafe Diabolique.*

At one time it did not look as though he would carry on the family tradition. It was only through his need of money for radio equipment when a boy that he went to work for his father. Roy was born December 19, 1902, in New Orleans, attended St. Aloysius College from 1913 to 1917, and entered St. Paul's College in Covington, Louisiana the latter part of that year. Here Roy became interested in amateur radio and, through the efforts of Father Martine Barre, physics professor of the school, he learned about the mysteries of radio.

With amateur radio activity at a standstill due to World War I, he was not able to get on the air until after the Armistice. It did not take long then to rig up a model T Ford spark coil and communicate with a cousin two blocks away. For receiving, Roy built a loose coupler from a Quaker Oats box and used a galena cat's whisker detector. For hour after hour, the boys would send messages to each other, hoping for some distant stations to join them. Although they could hear high-powered military and commercial spark stations outside of New Orleans, they did not have any luck making contacts until Roy installed a Zenith Rotary Gap and a Thordarson Transformer with a four wire "flat top" antenna.

Then the fun began, with Roy getting his first amateur radio license with the call 5RH. From then on the rotary gap was working

Exterior view of Antoine's Restaurant. Photographs, Leon Trice Photography, New Orleans LA.

night and day, working DX stations. However before long the radio inspector knocked on his door and gave orders to cut down the power. The rig was putting out two kilowatts and the inspector cut it back to one. With reduced power the rotary gap was still punching holes in the spectrum and station 5RH could be heard several hundred miles away and under favorable conditions, DX contacts were made up to a thousand miles.

Wavelengths were purely accidental during this era of the spark days and wherever the rig loaded or tuned the best was the operating frequency. Most of the high-powered radio amateur stations used from 300 to 1000 meters, while the fellows with limited equipment operated usually from 200 to 300 meters.

In 1922, Roy heard and read about the vacuum-tube which was just becoming popular. He bought a couple of UV-203A tubes and built a 100W rig. Then he got the idea to improve the receiving part of the station and purchased a Grebe CR-8 Receiver. This called for a new antenna and a six wire inverted "L" cage type antenna was installed. When everything was ready Roy tuned the new receiver and there was a station in England and another in Canada calling CQ. He decided to try for the English station first and gave him a call. After an anxious wait of several seconds, the station G5CB returned the call and gave him a report that his signals were very good copy. Roy nearly fell off the chair upon receiving such a nice report on his first overseas contact, especially with a new rig. After exchanging names and addresses for QSL cards, he went hunting for more worlds to conquer and before the night was over had worked several more stations in the U.S. From then on QSL cards began rolling in and the walls of his shack showed evidence of the growing number of stations contacted.

In 1924 Roy decided he needed more power to go after those "hard-to-get" stations. This time he built a 250W rig using the UV-204A and when it was finished it put out a wallop of a signal. With the new rig, he began working stations in Hawaii and Australia, with the list growing larger each day. He was now on his way to try for some real DX records and his intention was to work all the United States (WAS) and the continents of the world (WAC).

He was having a ball with ham radio 1930, when girls and sports cars took over. Little by little he lost interest and dust began to collect on the gear. However the sports cars and the girls did not last long, for in 1932 Roy got married and from then on he was too busy running Antoine's.

For the next 28 years there was no thought about amateur radio until one day in 1960 he had an accident and was laid up with a back injury. While convalescing, one of his friends brought over some QSTs so that he could pass the time reading. There must have been bugs between the pages. One of them bit Roy and again ham radio was flowing through his veins. From then on catalogs were scanned and plans made for the new shack. In the meantime, he recovered from the accident and went down to the FCC office and took the examination for his General ticket. After nervously waiting for several weeks, a notice came in the mail marked "PASSED" and Roy now was on cloud nine. The new call letters were W5RU.

Roy was now ready to continue with ham radio from where he left off in 1930. He

purchased a Johnson 500 AM Transmitter and erected a tower with a Telrex 3-element 20 meter beam. Again he began working stations in all parts of the world and having the time of his life. He was now on his way to complete the WAS and WAC records and get certificates.

It was not long before Roy found that the AM rig was getting him into trouble as the "hard-to-get" DX stations were in the single sideband part of the bands. Every time he ventured into this territory every one of the sideband stations told him to get sideband gear or *else*. So it was either "fight 'em or join 'em" and Roy decided to join them. He acquired an SB 101-A Transceiver and a 10A Exciter and from then on he was one of the gang.

Now it was on for more DX contacts which Roy loved so well. It was good hunting and one of his first contacts with sideband was working KL7FLC on a floating ice island near the North Pole. Then later working JT1AG in Mongolia was the start of some great thrills. As time went on there were others like Father Moran, 9N1MN in Kathmandu Nepal, a Russian scientific expedition at the North Pole, and a tiny atoll in the Pacific Ocean named French Frigate Shoals and a U.S. bomber flying over the Congo at 25,000 feet.

Roy swears that he never again will give up amateur radio and recently a Central Electronics 100-V with a Hallicrafters HT-33B linear amplifier was added to his station. The antenna was also changed not too long ago and now is a Telrex six element beam. This has made an improvement in his DX hunting.

During the years from 1960 to date, he has been awarded a number of certificates for his DX accomplishments and feels very proud of them. They are hung in a place of honor in his shack so his guests may see them. He has received the WAS, WAC, WPX awards and has run up his DXCC score to 270.

Although Roy is a very busy man running the House of Antoine's, he took time out in 1968 to take the examination for the Advanced class ticket and passed it with flying colors. Talking about licenses, very few people know that Roy once held a commercial ticket in 1923 but could not find time to go to sea.

Roy L. Alciatore W5RU sitting in operating position with visiting young Japanese ham friend, Naoyuki Kano JA4BVH. Kano is also 2nd radio operator on Japanese bulk carrier M.S. Mushasni Maru, N.Y.K. line.

Roy Alciatore, radio amateur and restaurateur, although host to thousands of famous celebrities, still enjoys being host to the many radio amateurs who visit New Orleans. During Mardi Gras week you might think a hamfest was in town by the number of hams found at Antoine's enjoying the gourmet dishes *par excellence*. Radio amateurs of many nations, while in the United States, have made special trips to New Orleans just to meet Roy.

PROFILE . . . Roy Alciatore, W5RU, would not be complete without some enlightening facts about Roy Alciatore, restaurateur. Since 1930, he has been the proprietor of Antoine's but before taking over the management, he learned his trade well. From 1920 to 1923, he was an apprentice worker in his father's restaurant and from then on continued studies in famous restaurants in France. Thus the gifted training of his father made him well prepared to take over the management of the House of Antoine's.

It would take many more pages to describe all of the unusual features of Antoine's, but for those who have never partaken of the culinary arts at this home of fine cooking, we will use a famous phrase, "Antoine's is to New Orleans what Delmonico's was to New York or Cafe Anglais to Paris."

. . .K6GKX

73 Books & Stuff

the Books

NOVICE CLASS STUDY GUIDE

$4

The world's easiest to understand book on the theory required for the Novice amateur radio license exam. Frustrated by fundamentals? Read this book. One simple reading should carry you through the exam.

GENERAL CLASS STUDY GUIDE

$6

This book will help you to really understand the theory and enable you to easily pass the FCC exam. This is not a Q&A manual for memorization. Study this book and go into the exam with confidence.

ADVANCED CLASS STUDY GUIDE

$4

Thousands have used this book to help them breeze through the Advanced exam with no strain. This is the ONLY study guide published which covers ALL the material you will have to know.

EXTRA CLASS STUDY GUIDE

$7

Does the theory required for the Extra Class exam panic you? No need, for this book reduces it to easy comprehension. Many amateurs find that a quick reading through this book is enough to get them through the tough Extra Class exam. Face that exam with confidence.

1974 FM REPEATER ATLAS

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Listings by states (or countries) and cities of all repeaters, both open and closed, in the world. Periodically updated. Handy size for mobile use.

FM REPEATER CIRCUITS MANUAL

hardbound $7
softbound $5

Contains almost every conceivable circuit that might be needed for use with a repeater. All circuits explained in detail. All aspects covered, from the operator to the antenna. Also contains chapters on setting up a mobile station, plus much more.

HOW TO USE FM

$1.50

This book presents the basics of two meter FM operation and repeaters in short form with the end in mind of getting you on FM quickly and easily.

It is easy to make some blunders when you are getting started with anything new. It is also embarrasing. A fast reading of this book should help you avoid the pitfalls.

VHF PROJECTS FOR AMATEUR AND EXPERIMENTER

$5

A must for the VHF op. Opening chapters on operating practices and getting started in VHF, both AM and FM, followed by 58 chapters on building useful test equipment, modifying existing and surplus gear, building complete stations, both fixed and portable, linears, converters, control units, preamps, band scanners, antennas, noise suppression, plus many more.

FASCINATING WORLD OF RADIO COMMUNICATIONS

$4

All about broadcast band DXing, tuning the tropical DX bands, DXing radio amateurs, antennas for shortwave, radio licenses, pioneers in electricity and radio, commercial broadcast stations, WWV, etc.

TVI

$1.50

Discusses all types of interference problems in great detail with recommended steps to cure these problems. Good for both the amateur and citizens band operator. Try this cure and suffer no longer.

IC PROJECTS

$4

This book tells how to understand and use ICs, with numberous construction projects.

COAX HANDBOOK

$3

All about coaxial cables, connectors and applications. It's all here — pictures, part numbers and specifications for all types.

SOLID STATE PROJECTS

$4

More than 60 projects of interest to anyone in electronics. The devices range from a simple transistor tester to a ham TV receiver. This collection will help you become more intimately acquainted with zeners, ICs and varactors, etc.

TRANSISTOR PROJECTS

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Crammed full of home construction projects, from receivers to transmitters and all in between. Chapters include such articles as zener diodes, how they work, how to use, test and buy them; integrated circuits; how to design transistor amplifiers; and many more.

DX HANDBOOK with MAP

$3

How to work DX, how to get QSL'S, country lists, award lists, QSL bureaus, maps of the world, great circle maps centered on major U.S. cities, DX bearing charts for major U.S. cities, how to go on your own DXpedition, and much more. Wall size DX map of the world included.

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INTRODUCTION TO RTTY

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In this book the world of radio-teletype is explained in an easily understood manner for the beginner. There's also a chapter on RTTY Art which will teach you everything you need to know in order to be a RTTY Artist. The last part of this book contains a bibliography of everything published about RTTY since 1952.

RTTY HANDBOOK

$6

A comprehensive book covering all areas of radio teletype, from getting started with the basic principles, what equipment to procure and how to make it work. The only up-to-date book available on the subject. Well written, easy to read and understand.

73 USEFUL TRANSISTOR CIRCUITS

$1

Useful transistor circuits for audio, receivers, transmitters and test equipment. 47 chapters with circuit diagrams for each, complete with component values, etc. A must for the solid state home brewer. Easy to read and to understand.

SLOW SCAN TELEVISION HANDBOOK

hardbound $7
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This excellent book tells all about it, from its history and basics to the present state-of-the-art techniques. Contains chapters on circuits, monitors, cameras, color SSTV, test equipment and much more.

DIODE CIRCUITS HANDBOOK

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115 diode circuits including power supply application, regulators, ac meter applications, receiver detectors for AM-FM-SSB, noise limiters, squelch, AGC, varicap tuning, audio clippers, compressors FM modulators, RTTY keying, varactor multipliers, noise generators,

VHF ANTENNA HANDBOOK

$3

Would you believe that the secret to success in VHF/UHF is in the antenna system? This is no earth shaking discovery, but it's true. A complete, detailed book with descriptions, dimensions, tuning data, diagrams and photos. Antennas from the instant coathanger to the giant collinear beam can be found here.

DIGITAL CONTROL OF REPEATERS

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Here's a book for the FMer who wants to design and build a digital repeater control system. Contains sections on repeaters, basic logic functions, logic circuit design, control systems, support circuits, mobile installations, touch-tone, plus a special section on a "mini" repeater control system.

CONVERTING COMMERCIAL FM GEAR

$2

General information on commercial FM gear with specific conversions for Motorola equipment.

DIODE CIRCUITS

$1

Full of simple handy goodies built with diodes.

the Stuff

73 CERTIFICATES

WAAS **$1**

Worked Almost All States — Proof of your having worked 49 of the 50 states. It is for those who are just unable to get that last state confirmed.

RRCC **$1**

This Real Rag Chewers certificate is awarded only for the feat of a non-stop QSO for a period exceeding six hours with no time out for anything. Order must be accompanied with date/time (GMT) of start/end of contact, station contacted, and your call sign.

DXDC **$1**

Available for those who present proof of contact (copy of log) with 10 different countries. Awarding this certificate makes you a member of the DX Decade Club.

RTTY-DXDC **$1**

Frame and hang this one above your machine. All operating award for those who have submitted proof of 2-way teletype communications with 10 countries. Endorsement provisions for different bands.

SSTV-DXCC **$1**

Dress up the shack with this award for 2-way Slow Scan Television communications with 10 countries. Endorsement provisions for separate bands.

ALL MODE DXDC **$1**

How many can qualify for this one? An award for 2-way communications with 10 countries using CW-SSB-RTTY-SSTV modes.

UNDERSTANDING XYL/OM **$1**

An unusual certificate — get one and keep your mate happy. An award to those who have the good fortune of having an understanding partner who appreciates all good things about amateur radio (staying up all night, spending money for rigs, etc.).

CHC **$1**

Presented to those who submit a sworn statement that they have never received a certificate for radio operating and if they ever receive one, they will hate it. This certificate should be your first before you accidentally do something and receive a certificate for it. This attests to your membership in the Certificate Haters Club.

Be certain to enclose sufficient postage for the return of your QSLs.

73 BACK ISSUES

VOL.1 **$4**

This is an assortment of twelve different back issues of 73 from the years 1960 through 1964. Normally these back issues would cost you $1 or more each, but since this assortment is our choice instead of yours you benefit with a big bargain. Here is a good way to build up your technical library with hundreds of interesting and valuable technical articles and construction projects.

VOL. 2 **$4**

Twelve different back issues of 73 from the years 1965 through 1967. These are the real vintage years of 73 for home builders of transistorized gear. Lots of VHF projects and gadgets galore. See for yourself what 73 was doing back when QST was

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the Stuff
(continued)

still bringing you only tubes. At this price you get our choice of back issues. This is an excellent way to fill in missing back issues, if you like to gamble.

VOL. 3 $4

Twelve different back issues of 73 from the years 1968 to 1972. These bundles are already made up so you have to accept our choice at this price. Individual issues for most months are still available for $1 each for these years.

MAGNETIC CALL SIGNS $4

Let the world know that you are proud of your ham call. These magnetic call signs will adhere to the side of your car, and they won't fall off at high speeds.

U.S. MAPS $1

These wall sized maps show the states and call area. They are specially designed for coloring to show your progress toward the Worked All States award of ARRL or the Worked Almost All States award put out by 73 (for proof of contact with 49 states). Since you will probably be wanting to work for the award on several bands you will want several maps. They come in groups of four.

WORLD DX MAP $2

This is the same wall-sized DX map that is included with the DX Handbook except it comes to you rolled up instead of folded. This is so you can put it on the wall or have it framed. The map is designed with all country prefixes indicated and space for you to color in the countries as you work them. Visitors can see immediately how much of the world you have contacted! The zones are on the map as well as prefixes. Maybe you need several maps.

CUSTOMIZED DX BEARING CHART $4

An amateur who works for a big computer company has a program which permits him to plug in your location and have it print out the bearings of all the countries of the world from your shack. Once you have this list you will use it for every DX contact. The chart gives the bearing and distance to all major cities and countries. Be patient when you order for these have to be run through in groups so that we can offer them to you at such a low cost.

73 BINDERS $5

These binders are a gorgeous red and come with the nicest set of year stickers you've ever seen. The perfect thing for storing your issues of 73 so that they won't get lost or spilt on, or into the hands of the Jr. Op. Dress up your shack with these binders.

LAPEL BADGES $1

Name and call identifies you at club meetings, hamfests, busted pot parties. Hand engraved by skilled New Hampshire craftsman with loving care. Only one lousy dollar. Send first name and call.

CALL LETTER DESK PLATE $2

How about dressing up your operating table with a desk plate showing your first name and call? These embossed desk plates are nice — and inexpensive. No zero available, sorry. There is room for twenty letters and spaces total.

Sue Miller W9CNW
R.R. 1, Box 95
Waldron IN 46182

IT HAPPENED IN MEXICO!

We (W9NTP and W9CNW) were on our sixth trip into Mexico when it happened. Don and I were driving toward Mazatlan from Ixltan on a Tuesday morning, and as we neared the junction at Santiago, we noticed a commercial bus had pulled off the highway and stopped at the junction while unloading passengers. I was driving about 25 mph past the bus, when a short, heavy-set Mexican darted past the front of the bus and into the front side of our camper truck. The impact bounded him back into the bus and onto the road. There he lay in a pathetic heap. We stopped immediately, blocked traffic, and tried to get help. All the people, and there must have been at least fifty around the bus stop, ignored us and the injured man. The bus had a schedule to meet and dismissed the accident by simply continuing on its way. There was blood under the man's face and on the road. I dampened a handkerchief and cleaned up his face. There seemed to be a surface wound on his forehead and cheek which was much like a floor burn. Some of the people motioned to us to get the truck out of the road because of some big semi-trucks barreling down on us. We and one unidentified man helped get the injured man into the cab of the truck. I got into the camper and Don left the back flap up for ventilation.

The injured man was able to direct Don to the hospital at Santiago – about six miles from the scene of the accident. Santiago is a city of about 20,000, but is completely off the tourist path, so few people speak English. It is down at ocean level, but inland, so very warm. Santiago had cobblestone streets, and the roughness knocked the back flap of the truck down on my arm and hand, and I sat there bleeding more than our injured passenger.

At the hospital an attendant helped get the man on a stretcher and carry him into the hospital via the front steps. The man could stand with no obvious pain, but to take a step hurt his side or ribs in some way. That was why they used the stretcher. No one around could speak English. A policeman was on duty at the hospital, and soon two others came. We drew pictures, acted out the accident, and used sign language to tell how the accident had happened. After

all our explanations one of the policemen got into the truck with us and hand-directed us to park in front of the city police station. Our arrival caused a flurry of conversation, all in Spanish, which neither Don nor I can speak or understand. We were directed inside the jail to an area just outside of a dark cell block filled with men. One jailee in the cell could speak a little English and asked us for identification which he copied down for the policemen. After our identification ceremony, we were motioned to sit behind bars near an unlocked door. For both of us – our first time in jail!

Then a Mexican school teacher showed up with a lawyer of sorts. The "shyster' was a tall, skinny man in a white shirt who flustered like Art Carney would do with every action. The school teacher spoke rather good English. He had gone to live with relatives in Los Angeles when he was ten years old and had gone to both elementary and high school there.

There was a lot of explaining, sketch drawing and saying, "You are not at fault – it will be fixed" but we remained in jail. A brother of the injured man was sent for and stood and looked at us for awhile. There was much more conversation, and the skinny man in the white shirt seemed to be "fixing" it. Another man came, identified as the Mayor of Santiago, and he looked at us for awhile, and then said we could go eat supper in the town's best restaurant. It had an electric fan that one could direct at their table. We had been in jail about four hours.

During our time in jail the other prisoners looked, laughed, sold us some string flowers they had made, and sent boys out for their food. In Mexico one takes care of one's self and needs while in jail. Local teen age boys live right there for the excitement and to wait on the prisoners for pesos. Some wives came and brought food for their husbands. The prisoners in the dark cell were in for stealing and fighting with intent to kill, we gathered, while the ones out in the area we were, were there for drunkenness. There were guards stationed right outside the unlocked door. The door had to be left that way so the boys who waited on the prisoners could go in and out freely, but each time they entered they were checked for liquor.

At about six o'clock the guard was changed. They all lined up with positioning of arms and each time they repositioned they grunted in unison. As we watched, the guards were taking on personalities. We called one John Wayne because he was tall, good looking, and more noticeable than the others. He tried to be friendly and sympathetic. The captain wore a brace around his neck, so he was Stiff Neck. A guard and the teacher went with us to supper. The guard with his gun in holster sat near the door and "guarded." The teacher said the police did not hold us at fault for the accident, but we would have to wait until the district attorney came the next day to release us.

A representative from our Mexican insurance came, and with our help and the help of the interpreter, filled out some papers, and I signed a statement in my own handwriting of how the accident had happened. This report was made after we were escorted by our guard to the best hotel in Santiago. (It had a ceiling fan and two-inch cockroaches.) We had left the truck locked up in front of the police station. They let us put in or remove our belongings whenever we wished but asked us to leave the truck there. The insurance was in order, and we were assured the injured man would have all the necessary care. Earlier someone sent to us in jail for money to purchase a pain shot before he was taken by car to Tepic (about fifty miles away) for X-rays. We were told that he had told the police we were not at fault, but only trying to help him. Someone at the restaurant had told our teacher-interpreter that we had better phone the American Consulate if we wanted to leave before staying three or four days in that sultry, hot city.

On Wednesday our interpreter met us for breakfast. The lawyer showed up and said we owed him $80 for fixing the case and this included $25 for the interpreter, and that we must give him $40 as a retainer. We said his price was too high for nothing. We phoned the American Consulate in Mazatlan and told him we had to get back to the States. He told us we needed a public defender, not the laywer. So Skinny-in-the-white-shirt said we should give him his expenses plus what-

ever we wished to pay him and pay the interpreter ourselves. We told him we were not going to pay anyone anything until we were released to go on our way.

The district attorney, a neatly dressed man about 30, arrived at his offices late. We, the insurance man, and the interpreter, all gathered around his desk, explaining. He pushed us away, saying that he couldn't fill out the necessary papers until the next day, or fine us, until he knew the injured man's condition. Earlier, at breakfast, a Mexican trooper had come and gotten the facts of the accident and assured us were were blameless. He said he would go to Tepic and check on the man at once, and report to the D.A. before he started over from his home in Tepic. At our meeting with the D.A. was our first news that we were to be fined for helping a man! We phoned the American Consulate again. This time he said by Mexican law we were at fault because the man had run into our truck. He also said that the insurance would take care of the man but we could get ourselves straight with the local law. Some help!

We asked the D.A. if we could go to Tepic to see how the man was and stay the night, because it was so hot in Santiago. The only real air-conditioning was in the banks. All other places had fans, and the people who had jobs there tried to get permanent seating in front of a non-rotating fan. The policeman whom we had named John Wayne stayed in the bank most of the time, and did his official guarding from there. The D.A. said we could not take our truck, but we could go with him at 2:00 P.M. when the working day ended. We decided to go to San Blas instead, and go on a jungle cruise, just to have something to do besides waiting for the next day and the fine.

The taxi we took to San Blas was $6.40 for going fifty miles. We got a double-double hotel room. (That means it has a room with twin beds and a room with a double bed, and you can take your choice.) Some people spoke English so everyone we met we were soon telling our tale of woe. An American with a cute, young Mexican wife said they would share the jungle cruise boat expense with us and take us with them to the boat dock. Each American that we talked to said we should not have become involved with helping the man and just left like the bus did. A hippie-looking student from the U.S. and his Mexican wife from Tepic, suggested we get our truck and just leave, since we still had the keys. They offered us their extra license plates for cover, which we declined. The wife said that if we were short of funds we could stay at Tepic with them, or if we were told the next day that we must stay longer,to go to their Tepic address and they would help us all they could, by perhaps getting help through the Tourist Bureau. They did help us phone the D.A. at Tepic to see if he had found out how the injured man was, and if he was working on the papers so we could be fined and on our way the next morning. The D.A. must have had a big night planned because he was not at the phone number he had given us earlier that day. An employee answered and told us that he did not think the D.A. had checked yet on the condition of the man, nor had he been working on the papers.

We planned on leaving San Blas and returning by public bus early the next morning, so we purchased some canned juice and sweet rolls to have in our room for breakfast. During the night there was a terrible thunderstorm. The electricity went off – no fans, no water.

The next morning there was no light nor water for Don to shave. He used a garbage can lid filled with rainwater and stood near the door with a vanity mirror. We couldn't find any glasses for our juice, so we used a deodorant can lid. After breakfast we took the "people's bus" back to Santiago for 12 pesos for both of us. The bus driver was very accommodating to his friends. He carried toilet paper, made deliveries, gave free rides and played a cassette recording that was barely audible over the roar of the bus.

We arrived back in Santiago just at 9:00 A.M. when the D.A. was supposed to be there. The interpreter was there waiting, but the insurance man was not, and he had been there pleading our case the day before. We searched for him around the area of the banks and in the restaurant which had been serving as his and the lawyer's office. They had even been using napkins there as note-paper and the public phone as their own.

Nothing was happening, and we began getting nervous about 9:30 A.M. Don started the truck to see if it was still all there and would run. It did, so he moved it forward to see what reaction this would have on the police who were guarding at the jail. There was no reaction at all! I went in the bank and got a 500 peso note changed to five 100's in anticipation that I might soon be paying the interpreter. "John Wayne" was in the bank guarding, and greeted me with a handshake. The captain was in his office with the door open, and we exchanged "Buenos Dias." Then we three stood and waited until 10:00 A.M. for the D.A. to arrive.

The interpreter said sometimes he doesn't come on Thursdays if he doesn't have a case and that his office girl had not yet arrived. What should we do? Wait another day to be fined? Don started the truck again and drove around the central plaza, moving it out of sight of the police station. Our decision was fast – we would just leave and hope they wouldn't stop us! After all, we were clear with the police, it was just the D.A. and his papers that were holding us up.

The interpreter walked with me across the plaza and Don drove two blocks away and turned. We got in and headed out of town. Don and I paid the interpreter 300 pesos and let him out to walk back and explain our disappearance. He said that he was going to tell the police that we had gone to Tepic to locate the D.A. since he hadn't come to his office that day. The day before, we had given the lawyer money for his expenses of locating people and making some phone calls, but nothing for himself because we were not free to go on our way. He got all excited on Thursday but wouldn't come face us directly, instead he sent word to us that we must think he was a relative or something for the pay we had given him.

Needless to say, we headed the opposite direction from Tepic. After much studying of our maps and trying to out-think anyone who might be after us, we decided to go through a border where many people might be going through and take a mountain road through much of Mexico. We were about 1,000 miles south of the border. We were hoping that if the D.A. really didn't come to work on Thursday we would have until Friday morning to get across before our names were on a "stop" list.

We drove from 10:00 A.M. until 7:00 A.M. the next morning, stopping only for gas, food and coffee to take with us to keep us alert through the night. The scenery through the mountains was beautiful. I wish we could have enjoyed it. The road we chose away from Santiago must have had ten bridges being repaired, and each one had a 15-minute stop for one-way traffic. We even saw one state trooper who paid no attention to us. Nerves – nerves.

About twelve miles south of Laredo we were stopped and asked to sign and give over our visitor's permits. Never can we remember signing the permits before. After giving them up we were motioned on – only twelve miles to go, but we must get through customs near the bridge and twelve miles was time enough to telephone ahead if we were on the "stop" list and thereby get us stopped. We tried to get in a busy line for Mexican customs, but even so the customs man went around to the back – to check the license plate, perhaps? He only peered in the camper for smuggled wet-backs. Don was really only smuggling me and the truck. If we were stopped, I was to jump out, run for the bridge and Texas, for help. The Mexican customs man waved us on over the bridge. I was so nervous that I couldn't find the bridge toll and held up the line for several seconds. Even American customs made us nervous, but there must be no communication between the two customs. We were treated very nicely and soon were motioned forward. Sure did enjoy a hearty breakfast that morning!

As we were leaving Laredo there was a road block. There was communications over the bridge after all, and we shouldn't have stopped for that breakfast. No, we were waved on, so it wasn't a camper truck and two American hams they were looking for.

Even after we arived home I'm fearful of all registered mail. I'm almost afraid to record this for others to read.

It's great to be on United States soil again and home in Indiana. We won't be returning to Mexico – until next summer.

. . .W9CNW

73 DUZZ

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73 MAGAZINE INC. *Peterborough, New Hampshire 03458*

Letters - Cont'd From p.11

RBL-4

I have recently acquired an RBL-4 Very Low Frequency Receiver. The unit is navy surplus and covers from 15 to 600 kHz in 6 bands. It has a regenerative detector but is surprisingly sensitive, stable and selective. I am using a 120 foot dipole for an antenna and it seems to work quite well.

Early this morning I was tuning around and decided to log everything that I heard. The results are not too surprising. But, nonetheless I heard much, much more than I had expected. The log goes as follows:

kHz		
12.5	Tones	
18.4	RTTY	
36.0	RTTY	
75	RTTY	
88.1	CW	NAM
90–110	Loran C	
123	RTTY	
140	FAX	
184	RTTY	
194	Beacon	TUK
204	Beacon	SOG
218	Beacon	EPP
225	Beacon	BUT
235	Beacon	CNH
250	Beacon	DRC
262	Beacon	AMH
270	Beacon	TOF
282	Beacon	REI
440	CW	CFH

If anyone knows the location of the above aircraft beacons and miscellaneous stations, could they please write to me at the following address: Michael Kane WA1PJG, 50 South Porter Street, Manchester NH 03103.

Anybody interested in forming a club of VLF listeners should write me at the above address also. As an addition there is also a new band in the VLF spectrum that can be used as a license free 'Ham band" (160 to 190 kHz). Power input is limited to one watt and antenna length is limited to 50 feet. OKay all you QRP men, here's your chance.

Michael Kane WA1PJG

Hey, enjoyed that cover of May. Had bugged you for a year or more for a pin up for "us" women.

XYL WB4ELE
Joseph L. Mimms, Jr.

I just completed the 'Cheap 10 Minute Timer" on page 47 of the July issue of 73 Magazine. Really great project, works beautifully. I thought that I would put it on a pc board, but found that according to Murphy's Law the etch bottle was devoid of fluid. Nearest supply was Richmond IN – 30 miles one way, and with gas at 58¢ for regular, ugh, must be a better way – there was. Took out the trusty hack saw and sawed 5 slots just through the copper of the board to fit the 555 pins, sawed one slot length ways of the board, and another across the board and presto instant PC board with isolated pads. If the constructor is ambitious he can drill and mount from the insulated side – if lazy like me he can simply solder to the foil side using a small cone tip to install the 555 – be sure the board is pre-tinned and solder quickly. The slots for the IC should be about as wide as the pins on the top side of the IC. A few jumpers and you are in business. Incidently a 32 tooth blade works much better than an 18 tooth blade in this type of work (hacksaw blade that is).

Charles T. Larson W9JWH
Connersville IN 47331

DYCOMM AGAIN

I read with great interest the letter in July on the Dycomm Super "D." I too have experienced the same trouble with my kit and now have retired it after eight days of service. Both of the transistors in my unit went out.

I was driving my Dycomm with the Drake TR-22 and while it worked was getting about 20 watts output.

Fred Brockway WB4SLW

LICENSE SYSTEM

Concerning the recent flurry of activity about changing the structure of the licensing system. I feel that the present system is fair and does exactly what it's intended to do, namely, to keep our ranks down to those who are truly interested in radio, as a hobby and a progressive, modern, communications service. So what if the current trend in our growth is down 3% or so.

I'm a newcomer to amateur radio, belong to no clubs or organizations, but try to keep abreast of current feelings toward our hobby by the younger segment of the population. Being 19 years old and getting my first license as a result of a high school class, I think I'm in a good position to take the soap-box. After watching 3 years of students go through the mill for their Novice license, practicing code copy 20 minutes a day for 3 weeks, and seeing not one fail, I'm convinced that difficult entrance is not that big of a problem.

I would like to point out that perhpas the problem isn't in the licensing system, but in the availability of willing examiners for the Novice-to-be.

Ready to take my code test, I went in search of the nearest 80 foot antenna tower and upon pounding on the unknown door. . .

"Um. . .Sir. . .will you give me my Novice code test?" Blank expression.

"Oh, you're a CB operator?!"

"Well, sorry, wrong house."

10 thumbs Cook promptly goes home and listens to his SW receiver for another 12 months. Before hitting the CBer, I'd tried two or three hams in the area, each giving me an excuse to rid themselves of me.

I'm looking forward to enjoying this hobby for many years, but it worries me that more people are harping large numbers instead of good organization and responsible, educated operators. To those that are doing this, I would ask that they view very closely how little control can be exercised over the CBer, (even by their own ranks). I believe I will sell my gear if a liberal banded, code free license with a Novice exam is implemented. 4 WPM and 13 WPM code copy jus' taint that hard!

Brian J. Cook WBØEPP

I have just read the article "Restructuring Amateur Radio" in the July issue of 73 Magazine and feel I should send you my two cents worth for what ever it is worth.

Some years ago I belonged to ARRL but when they advocated taking segments of the various bands away from the General Licensed Amateur and made it necessary for the General to take more advanced tests to upgrade their license in order to recover the privileges we once had I objected to ARRL by letter and on the air. I further predicted if their proposal ever went through many prospective hams would stop trying and manufacturers of ham equipment would stop making this equipment. I guess I need not tell you their proposal finally went through and I know of three major manufacturers went out of the ham business and turned to CB. I see two of them are now trying to come back. The ARRL tried to make us believe this was incentive licensing. I may be getting old and queer, but no one can convince me that taking something away from someone and then tell them to take more tests to get it back is incentive anything. As soon as this happened I dropped out of ARRL, never to rejoin.

As far as our license structure is concerned I feel it is hinged around CW too much. Yes there are those who only want to work CW and there are those who only want to work phone; I am one of the latter. I am a retired person and CW comes very hard to me, so I guess I must stay where I am.

As far as frequencies are concerned I feel they (FCC) should be more liberal. I have listened to some good DX, but out of my frequency I could not try to work them. Why can't we have some of the phone privileges the other countries have? I have no objec-

tions in taking further tests on FCC rules or technical questions even though I must travel sixty miles one way to take more tests.

I have been a subscriber to 73 Magazine for several years and think it is one of the best. I am all for you in your problems with the IRS and hope you win out in the end. I, too, have been one of their victims due to a mathematical error in my return.

K3KBG

VTR INFO

A recent article in 73 indicated all that was necessary to record good video from a TV receiver was to tack a wire on the video detector diode and plug it into the VTR. Unfortunately, though your low cap. scope probe might provide 1 V of clean video, try sticking a 75 ohm resistor across the scope input.

Results: No video, no audio.

Here's a quick and dirty method I've used several times. FET input (HI Z) emitter follower out (LO Z) negative sync. Just what the doctor ordered. The VTR we have been driving has a 75 ohm AC and DC load at the video input (BELL & HOWELL MODEL 2966). If you don't like DC into your VTR you can use an emitter load resistor and a BIG capacitor with good results. To recover good audio you must get the 4.5 MHz sound carrier past the point of video detection so I've included the switching system we use. For the short coax runs within the TV receiver I use RG 174 because of its size and low cap. Then RG 59 U to and from the VTR. The positions of the 4P3T SWITCH are #1 straight through (NO VTR TAPS) #2 VIDEO & AUDIO RECORD #3 VIDEO & AUDIO PLAY BACK. Adding a VTR to your ATV System is not difficult.

I was happy to see a new series of ATV articles by Terry Fox under ATV RASTER. I hope he will also include some special effects ckts, I C Video amps (MC 1350?), state of the art camera, etc.

Richard Wright
Engineering Vice President

QSL CARD WINNER

I just wanted to express my surprise and delight to see my QSL card in the July issue that arrived this morning. I am also glad the card was printed right side up, otherwise who knows what TLS 7K is? The card is a plug for keeping CW alive and healthy on the ham bands!

I have been having fun with that 21 WPM tape of mixed characters. I am hoping to press on to higher ground like an extra class license exam next month. And being in my business you are supposed to press onward to higher ground!

(Rev) Bill Ehlers K7SLT

MORE COMPUTERS

I would like to see more computer articles as follow up to the article in the (I believe) October 72 issue. I realize that these would only be of interest to a few of your readers, at least at first, but the uses to which they could be put and the proliferation of low-cost components seems to me to make this a field for amateurs to explore. Perhaps a monthly or bi-monthly column like SSTV Scene, etc., could get things started.

Regarding your editorials about the IRS or Walker or whatever may come up in the future – don't back down. The only way things will ever get better is for enough people to make enough noise until the body in power can ignore it no longer. Governing organizations always become as bad as the governed will stand. They either forget or ignore the fact that they derive their existence from the governed and not the other way around. Anyway, keep it up – you can't put out a fire unless you know there is one.

Don't let the prudes dictate what you run on your covers. You don't need bare skin to make a good picture (April 74 for example – exquisite!), but it seldom hurts. If the picture is appropriate use it.

Larry Dingle
Garden Grove CA 92640

RESTRUCTURING ?

I just received a check from you for my story entitled "Short Ship." I can't thank you enough or tell you what it means to me.

Not to tell you my life story or anything like that, but I'm 27 and have been handicapped all my life. I have never worked or lived at home with my parents.

Needless to say your check for my article was the first money I have ever earned. It sure was a wonderful feeling and again I want to thank you for the great privilege. I hope with your permission to send in more humor articles in the future for your consideration.

It is more convenient for me to write or print than to type. I hope this is okay. Keep up the great work in 73.

Steven Rich WA1DFL
31 Arlington Avenue
Revere MA 02151

ANON LETTER

Who the (unintelligible expletive) hell do you think you are, impugning the IRS? That's a fine little collection agency, Buster. For example: I'm just a plain peon who never made enough in one year to fill a (unintelligible) San Clemente (unintelligible) pot, but the little guy means just as much to the IRS as you Eastern big shots and by golly they took time out to give me two complete audits. I couldn't ask for more attention! And when they found out my returns were straight arrow they gave me back my records.

They didn't even charge me anything for all the time it took. I was amazed that they would bother with me because I've never had any investments or stuff like that – just a lousy paycheck and a lot of medical expenses. Made pretty dull reading for those people, but they didn't complain. No sir.

One time, years before the audits, they sent a message to me where I was holed up in a little village on the Bering Sea telling me that a U.S. Marshall would be confiscating all my property (!), and I was not to sell anything or wipe my (untelligible), etc., until further notice. I knew this was just a mixup so I sent them a wire advising them to (unintelligible) off. They did. I had claimed as a total and uninsured loss an airplane I had personally flown into hard ground at 60 degrees below zero near Gulkana, Alaska. We wrote back and forth about this, but as I said they just seemed to get more mixed up until I had to tell them to (unintelligible) off. I've never cheated them, and they haven't cheated me. I just wished they wouldn't waste their time on me. One time I talked things over with one of the ladies in their Seattle office and she was so nice I felt sad and disoriented. Just don't use my name.

Anon.

EQUIPMENT

Mr. Butterfield has passed away – so please do not send any more magazines.

If by any chance you know of anyone in my area that would be interested in some equipment, please advise. Thank you.

Mrs. Howard Butterfield
Union NJ 07083

THANKS

Thank you, Wayne, for the outstanding job you're doing for the amateurs of America – you really make an impression – I can't talk to an amateur anywhere who isn't either 100% for or against you. It shows that you and your magazine are making an impact. Keep up the good work.

Robert N. Ernst WB2GYO/3
Washington DC 20336

CB

How about all you Hams that are truck drivers putting a rig in your truck? I've had an FM radio in my truck for 2 years and have worked repeaters all over the country. I've made a lot of eyeballs and friends that I couldn't have done just operating in the shack. I fill a log book up almost every run. How about it? Get away from the C.B. crowd and join your buddies on the Ham bands.

Bill Zellers WB6WYU
Anshiem CA 92801

good idea! - w.g.

NEW BREED ?

The April edition had an article, "The New Breed on 2 Meter FM," by K2PPM concerning the practice of buying and selling exams; in the article, these were sought by ex-CBers.

It points out one basic truth: What a person earns he respects; what he obtains otherwise is of low esteem. Just listen to the garbage on many repeaters carried over from eleven meters! The whole situation is one helluva good argument for much tougher incentive licensing. And now that the FCC is looking into the true qualifications of Techs they are re-learning what so many old timers have said right along: *Reduced license qualifications always results in reduced operator quality.*

Technician licenses should be issued based only on an exam administered by the FCC; they should not be renewable. Also, General class should be renewable only once; thereafter, up or out! And let's get 2-meters back into the incentive plan along with 220 and 450.

Al Chapman W6MEO
Alhambra CA 91801

Harsh words, Al. Is it possible that 2m FM is different in So Cal from the rest of the country? Perhaps it is the difference that has resulted in bad 2m operating, not the Tech license itself? Suppose your conclusions are biased by the peculiar situations you have in So Cal? Is it worth more wide study?. . .wayne.

DU DIRTY WORK

As an Amateur in the U.S. Navy it is frequently impossible to operate while stationed in foreign countries. Even though reciprical licensing is on the increase it still is not a reality in the Republic of the Philippines. It appears that only certain privileged individuals are allowed to operate in the Philippines.

I and many other hams have been trying to get the U.S. Embassy to push for a reciprocal agreement with the Philippine Government. We have written Senator Goldwater, who was unable to get anything accomplished.

Now we have discovered that the main reason nothing is being done is that a certain individual in the U.S. Embassy Staff in Manila is stopping and discouraging any formal action of concluding a reciprocal agreement between the U.S. and R P. Governments. The real "Kicker" in this is that same individual has these privileges and is licensed to operate here in the Philippines. It appears that he wants to belong to an elite group of one. It is unfair that someone in the Embassy should be able to operate while an American Service Man cannot. I think it stinks and smacks of political influence. It appears that someone should be able to do something about it. What's good for one American Amateur is good for another.

Another note on the same subject is that the Philippine Amateur Radio Association is a strong proponent of reciprocal privileges and have supported our plight to their government.

Harry E. Tasker W5OIQ

I have never subscribed to your magazine. I have, though, read some of your articles in friends magazines and thought that you were rather biased in your views on the ARRL. A recent experience has changed by opinion.

To make a long story short, a group of servicemen stationed here in the Republic of the Philippines have been trying for a long time to secure a reciprocal amateur radio operating agreement between the United States and the Philippines. You recently received a letter from W5OIQ, Harry E. Tasker, containing copys of all our efforts to date. A similar package was sent to the ARRL by me.

While I didn't expect an onslaught of assistance, I really didn't expect total apathy either.

You can expect a future subscriber.

Robert W. Johnston WB4SNN

RESTRUCTIONING

Just read with great interest your commentary on a restructure of the licensing scheme.

Two things you do not mention that I have heard bouncing about are a so-called "Japanese Plan." based on a no-code beginners license in Japan that is deemed very successful, and a dual-ladder structure wherein there would be an HF-licensed progression, and a VHF-licensed progression.

My own feeling as a inveterate "commentator-on-Dockets," is that perhaps a beginners no-code VHF Novice license be created with privileges only on 220 – but no repeater privileges.

I was going to write a proposal to FCC and formally submit it, but feel they're glutted now and it's better to wait for a Request for Proposed Rulemaking since much of FCC own solutions might be OK (did I say that? Must have forgotten 18803!).

Anyway, thought you might be able to shed some light on that Japanese Plan and the dual ladder licensing structure.

Oh – why 220? To get it used! EIA wanted to sell "radios" up there, so maybe they still can.

William John Good, Jr. K1HZN
E. Derry NH 03041

GOOD STUDY GUIDES

Help, help, help. Please rush General Class Study Guide immediately. Have used ARRL and found it to be of no use on current test I took last evening. Know your study guide of over 200 pages will do more good than one of 20!!!

Love your magazine. Give the IRS "HELL."

Ann Williams WN4EQC
Richmond VA 23233

TRULY GREAT HAM

I very much enjoyed "The Truly Great Ham" in March "73." The author has me and a lot of other hams right behind the old 8 ball. I can't wait to see the reaction to her next story (The Conventional XYL) when it is published. It is interesting that Laura takes such liberty at shooting down stray hams. Now for the awful truth. *Laura Sargent is herself – a ham.* No longer can she say all those things about how weird hams are with a straight face. She has had her tongue in her cheek for so long that in another few months her face will become deformed, unless of course, she moves her tongue from one cheek to the other. (Turning the other cheek?) I can say all this and not get sued for liable because I know her quite well. For 3 years she nursed me through C.B. and was there when I finally snapped out of shock and got my ham ticket. For this I say thank you. Her call is WA7YUA.

Bill Sargent WA7UJH
Phoenix AZ 85022

THANKS TO 73

Enclosed is a check for $3.95 for a copy of your 13 WPM Practice Tape. Your *Amateur Radio General Class License Study Guide* is very well done. Nine bills to take or upgrade is one thing, but to wash out a couple of code tests at nine dollars a shot is to be avoided if possible.

Keep up the good work, you people have a fine magazine. QST said in April's, "It Seems to Us. . ." that of their sampling of amateurs from the *Callbook*, "More than twice as many read QST regularly (66%) as read. . ." any of the rest and 57% rated it as their favorite. I suspect you have seen the article, and it looks like they have found out why amateur radio is in such a mess, though I am sure they don't see it that way. Five years ago I was WN4GJL (God Jollys Loose), and a devoted League member. I found the projects very technical and costly, requiring "easy" to get things like gold plated P-C boards, etc. At the end of the year I didn't even try for a higher grade license. That may not be the League's fault 100%, but they did not help. 73 has got me interested again, and for that, I thank you all.

Edwin J. Jolly
8359 Alvord Street
McLean VA 22101

DEAR 73

We are planning on starting a beginners class this summer and after hearing one of your tapes are convinced this is what we need.

Robert H. Rhoades K7ERB
Scottsdale AZ 85256

Letters cont'd

Even more letters...

RE K2PMM

I really enjoyed the article by "Wretched" Coward in the April issue of 73. Always did wonder what happened to him. Perhaps this might be 73's answer to that chap who use to write that column with the "Feenix" byline.

One question: Is it true that 'PMM never made it past the Technician class?

Keep up the good work, Wayne.

W1AIM/1

(Doubt it. . .wayne).

6m REPEATER

What do you think the possibilities are for getting modifications to the Repeater rules? I operate a 6m repeater on top of a local mountain and this mountain is approximately 1500 feet high, so we must use a transmitter ERP of 25 watts which in this hilly country is crazy. The FM broadcast station here runs 36 kW ERP and we have problems getting around the many hills in the Seattle area and 25 watts of power on our repeater really gets lost in parts of town. I guess what I am saying is what may be a good rule when applied to flat country won't work in our mountainous country here on the West Coast.

Ernie Opel W7YTE
Seattle WA

LIKES US

I have been an active amateur for many years, and really appreciate the many fine articles presented in 73. . .please keep up the good work.

I expect to see many more fine articles, especially with respect to IRS tactics, from W2NSD. . .keep up the excellent work, Wayne. . .there are many of us who admire your courage in opening up such a "can of worms."

R. R. Davis WA4DJG
Pompano Beach FL 33062

Without "73's" help our repeater (WR2ABX) would not have been licensed as easily as it was. We here at the Kavaler household (OM, Ed, WA2ZMI, JR-0#1, Ira, WA2ZIR, and JR-0#2, Frank, WBZCFJ) all thank you.

Ira F. Kavaler
Brooklyn NY 11226

(you're welcome — wayne).

I got my start in Ham Radio two years ago. I have seen and read about all the "ham books" published. "Ham" is too far over my head. "C.Q." is a dirty low down underhanded publication. They told me when I got my Novice ticket, they would send me 6 months free subscriptions. After two free copies they gave me the old song, "price of publication has gone up, we can no longer afford to send you. . .etc." To hell with C.Q. Q.S.T. is okay — I like it alright (sorry Wayne). But I really enjoy "73." It's the very best ham magazine publication put out. I really enjoy it.

Dick Jones
Granite Quarry NC 28072

THANKS CLEGG

Through the medium of "73," I would like to thank Ed Ivey of the Clegg Company for the trouble he went to over my 27B.

I called Ed because a dealer who doesn't advertise in "73" didn't send my set in for a check-up as promised.

The dealer had moved premises and still had my set with him. He didn't let me know he had moved. If it hadn't been for Ed Ivey, I could have been permanently Q.R.T.'d on 2 meters.

Thanks to Ed who chased him down and got some action. That's one dealer in Cincinnati who won't get another dime out of me.

Most manufacturers don't go to that trouble — Clegg and Ed Ivey DID.

David J. Jarman
Aurora, Indiana 47001

COMMUNICATIONS

I read with interest your recent editorial in the January, 1974 issue particularly the sections pertaining to automated mail handling and other telecommunications substitutes for paper shuffling, book bookkeeping, etc.

As an active ham (WA8VBN/6) and a communications scientist, I can say that much of which you speculate about is already either in prototype form, or available on the market.

For instance, there are a considerable number of large information processing type companies (or their divisions), ITT, Xerox, GE Information Systems, etc., that have developed information retrieval services. In fact, beginning in 1975, one major publisher, Chemical Abstracts will only be supplying their publications in computer tape format. Of course, there are literally dozens of companies that offer automated, computerized retrieval services (e.g., ISI, Philadelphia, PA.) whether in hardware form or in software form abstracting articles and concepts the user identifies.

However, you dealt with two other issues I would like to briefly describe. One, automatic, electronic message handling. Two, home terminal use and potential software.

In the first there are a number of networks (e.g., ARPA) that already, within professional circles, handle messages and communications electronically. At the network nodes, you will find completely paperless offices, with secretaries inputing all information via CRT. Whenever hardcopy is needed, they simply activate a hardcopy or facsimile machine. Further, these networks allow persons on the net to communicate with each other via message switching computers which store and forward electronic mail destined, and accessible only to the targeted individual. A related development, is the emergence over the last three years of specialized common carriers who provide computer networks; analog lines of bit capacities in the hundreds of MHz, and digital lines, all across the country. These companies are emerging as a result of FCC decisions restricting the monopolistic position of Ma Bell in the same way that the 1968 Carterfone decision opened up Ma Bell lines to non-Western Electric equipment (of course hams for years had been attaching to those lines without much squable. Likewise, a new class of networks, called VANS, Value Added Networks, take Bell's lines and via state of the art technology offer analog and digital transmission channels and efficiencies that for high volume prices beat AT & T's prices. Considering the impact of private equipment manufacturer's office phone systems, home cable TV attachments, you can predict what will happen in a few years.

In addition, there is a large emphasis now on automated offices, which perform exactly what you describe, replacing phone, typewriter and paper. Paper handling is as obsolete for communication as physical proximity is for communication. Hams, of course, have always known this, with repeaters, phone patching, etc. Now the business community is in fact getting into the act.

In fact, I'm working on a large National Science Foundation grant investigating telecommunication substitutes for transportation. This investigates the technology, acceptability, tradeoff factors involved in substituting the morning commute for interaction via home two way terminals. As you no doubt can guess, this raises a number of issues.

Moving on to home terminals use, let me tell you that all that stands in the way of widespread networking via home terminals, including EFTS (electronic funds transfer), home medical diagnosis, education, library searches, catalog shopping, etc., is the penetration of cable TV. Cable TV has a current penetration of about 10% nationally; although up to about 40% in selected metropolitan areas. As long as national penetration is below 50%, RAND studies, et al, estimate little incentive for the public and the manufacturers to generate interest in cable as anything other than "better TV and FM reception. . ." the latter being an extremely lame interpretation of its potential.

There are already some pilot two-way cable systems in the country providing prototype services. What these systems are testing is the psychological and economic feasibility of such services.

Incidentally, there are few electronic problems left to be solved,

Letters cont'd from p.135

although many of these are of the chicken and egg variety – not enough demand keeps R & D money out, or keeps prices too high for popular adoption, and vice versa. One of the problems still being investigated is the one of channel bandwidth, especially as it relates to video. I astound my friends when I describe Hamdom's activities with slowscan, and the consequent bandwidth compression. Only now are some of the larger corporations touting that they can manufacture home videosystems that change frames every 12 seconds!!

Incidentally, the Post Office is investigating various forms of electronic message handling, including all types of automated mail handling.

Well, the purpose of this letter is not to merely describe these to you, but to advise you that I'd be interested, if you're interested, in writing an article or two on such developments, and related ones, primarily dealing with issues I've discussed, but also how these applications utilize some of hamdom's techniques. Not only would such articles bring the ham fraternity up to date on "what's happening" in the outside world of communication applications, but perhaps might spark the interest of technology/software type entrepreneurs that read 73.

I look forward to hearing from you.

Gerhard J. Hanneman, Ph.D.
Information Sciences Director

W2NSD/1 cont'd from p.3

decide to canvas the neighborhood for books for the local hospital – for a mental institution – for games for day care centers – toys for poor kids for Christmas – organize an auction – etc. Just think constructively, if possible.

MORSE CODE SPECIFICATIONS

During the making of the 73 Morse Code study tapes there was a question of what actually constituted 13-per. Thirteen five letter code groups, obviously – but how long should each letter be? A five "e" group goes by awfully quickly, while a five "y" group hangs in there for a long time.

It turned out that the FCC has surmounted this problem by setting up the standard for word length – they use the word 'paris" for reference. Using this, we set up the 73 study tapes to match the FCC standard of speed. We wanted to make sure that users of the 73 cassettes would have a little extra margin for error (and panic), so we upped each speed by one word per minute. The FCC exams are in plain language, and that makes them even easier.

Users of the 73 cassettes have been writing to tell us that once they mastered the tapes they had no problem whatever with the code exam. Since more people flunk the code exam than the theory, this is a big plus. It's nice to protect that $9 exam fee – not to mention the embarassment of failing and the wasted time.

Techs being recalled for monitored exams will appreciate the six word per minute cassette. It is sent at the official FCC rate of 13-per for each individual character – a little item which comes as a terrible shock to many Techs when they come in to face The Man.

We've checked every code course on the market we could find and not one of them seems to be made up using the FCC standards. Perhaps we're the only one to check.

By the way – many readers have been getting the 21-per tape and telling us that they are surprised at how easy it is to learn to copy this. They all expected it to be almost impossible, yet in a few days they are getting just about every character. There is nothing difficult about learning the code except getting down to practice.

TECH EDITOR JOB OPEN

If you are a reasonably good writer and know your technical onions you might be interested in working for 73 Magazine up in the beautiful mountains of New Hampshire. If you're a died-in-the wool ham, there is nothing more satisfying than working for a ham magazine. The job includes, among other things, preparing articles for publication, preparing the newspages, checking schematics etc. The pay is good and the people most congenial. Send a resume or letter to 73 Magazine, Peterborough NH 03458.

SSTV TAPE AVAILABLE

Though no reason suggests itself as to why anyone would want to spend $3.95 to get a 60-minute cassette of the twelve best entries in the 73 Magazine Slow Scan Contest, copies of said tape are available. The cassette does make an excellent demo of slow scan for hamfests, club meetings and such. It might even be helpful for store demonstrations of slow scan. Well, whatever your bag, the cassette is available for $3.95 postpaid from 73 Magazine, Peterborough NH 03458.

LAST MINUTE FCC RELEASES *See p.139*

New Products cont'd fom p.11

CUSHCRAFT RINGO RANGER

Cushcraft has announced a series of Ringo antennas which have three half waves in phase by virtue of an eighth wave phasing stub. There are models for the 146, 220 and 450 MHz bands. This new antenna has both added gain over a regular Ringo antenna plus greater concentration of the signal on the horizon, where you normally desire it. Ringo owners may prefer to get a conversion kit to extend their present antennas. These, too, are available from Cushcraft distributors. Cushcraft clams to sell more ham antennas than all other antenna manufacturers combined – and this seems like a reasonable claim.

CUBEX QUAD

The Cubex Company of Altadena, California makes one heckuva line of quads. The hardware is definitely not shoddy, it is heavy, heavy duty designed to take all old mother nature can dish out and still be zapping out that big signal.

Latest addition to the family is the 4 element Zone Master. The spreaders are heavy guage aluminum-machined so that a chisel must be inserted in the key way to obtain clearance for fitting to the boom. After removing the chisel a press fit is the result. The bolt is then tightened and the spreader is locked for life. The arms are of sky blue fibreglass-strong, light-weight and pleasing to the eye. The elements are of copper, heavy tin plated. The 3" boom is about as indestructable as a boom can be.

Specs are conservatively stated as: 12-14 dB gain, power handling in excess of amateur limits. Boom length 30' – OD 3". Turn radius 17' wind load 7.2 square feet, weight 72 lbs. Front to back ration 24 dB minimum.

Brochure from *Cubex Company, P.O. Box 131, Altadena, California 91001.*

Joe Kasser G3ZCZ
1701 East West Highway, Apt. 205
Silver Spring MD 20910

The traveling ham covers a wide field. It covers the whole FM field from a user point of view, telling outsiders what sort of activity there is in your area. It covers the mobile field and the portable antenna set ups. It also can touch on the qrp field because those rigs can be made very small and are thus suitable for the traveling ham. It also covers reciprocal operating, how to get a permit and use it. It also can focus on amateur radio activity in other countries and show how it differs from in the USA. What it actually covers is up to you, the reader. If you want to read about repeaters in the USA or about operating activity in other countries or putting a rig in your car or operating out of a motel window, you have to invest a small amount of time and a 10¢ postage stamp and let me know. I usually answer personally to most letters as well as use the information in the column.

Talking about two meter repeaters, what sort of wild id's does yours have? Do you know about the one in Delaware that has a sexy female voice identification, or the one in Atlanta that identifies by voice (female) and gives the time, or the one in Virginia that puts an HI in morse before the morse identification, or the one in the Washington DC area that signs DE WR3ABU AMSAT RPT in morse code. It must surely have the longest id in the world.

You will probably have noticed the change of qth on my byline. I am writing this just in time to make the deadline (I hope) surrounded by boxes and the rest of the debris of moving and packing. The ham gear is all packed as is the antenna but the rig is still on the bench and I think that I could be on the air again within minutes xyl permitting. Still it's only when you move that you realize how much stuff has accumulated.

Another facet for the traveling ham to consider is to work through OSCAR. It can be done using a two meter FM rig in the CW mode for the transmitter and a sensitive ten meter receiver for the downlink. All you need to join in the fun is a crystal to put you in the OSCAR uplink (145.9 to 146.0 MHz) and about 100 watts erp, that is 50W to a 5/8 mobile whip on the trunk. The receiving antenna can be a Hustler ten meter whip. Just park out in the open in time for a pass and join in the fun.

It's a shame that commercial SSB transmitters or transverters are no longer being sold in the USA, because these are ideal for OSCAR work. Over in Europe FM/SSB rigs are available for two meters with synthesized frequency control, as are transverters and AM/CW rigs. It seems that FM has taken over in the USA on VHF at least and has driven all other modes out. One transverter in England comes with cables so that it may plug straight into the Yaesu FT101. Now that AMSAT has another active control station for the European area OSCAR activity should increase enormously so for the traveling VHF ham a new world of DX has opened up and should be used.

Talking of using VHF, many amateurs in the USA are talking about the expansion of the amateur HF bands and even the allocation of new bands at the next frequency allocations conference, well stop for a minute and note that Singapore lost the use of its two meter band. France has lost some of its 23cm band including 1296-1298 MHz and is sharing its two meter band with the military. This is not similar to the attack on 220 here because two meters is an internationally allocated exclusive amateur band. We amateurs now have to claim our VHF/UHF bands because once again history is repeating itself. First we were given the HF bands, and when their usefulness was proven, they were taken from us leaving us just a few hundred kilocycles instead of the wide open spaces that we had before. Now that space communications have shown the dx reliability of VHF we are about to loose our VHF/UHF bands unless we can show that we use them, so you traveling hams come on and do your bit and work OSCAR. While you are out there waiting for that next orbit put pen to paper and let me know about the activity in your area.

G3ZCZ

Here, reprinted from the fine club bulletin of the K1FFK repeater group, "The Squelch Tale," is what happened to one of their errant members who decided to kachunk the repeater on a regular basis.

de WA1PVV

Well people how does K1FFK sound at 6:00 AM now days? No more urpppps to worry us. I am probably beating an old horse, but for the people who were not aware of what was going on, I'll tell it one last time.

On Monday, April 22, 1974, WA2CSQ asked me if I would like to join him and Peg (WB2RZZ) on a fox hunt, in hopes of tracking down the Burper. Needless to say I was more than willing to go on this hunt.

Friday, April 26, 1974, time 4:00 AM WA2CSQ and WB2RZZ and myself left my house headed for Schenectady with toothpicks in our eyes and 3 radios and a field strength meter. We arrived at our destination about 5:10 AM, parked the car down the street from our suspects home and waited. We did not know if he was doing his burping mobile or from his home. At 5:45 AM he left his home with us in hot persuit. We followed him to a school where he dropped off a passenger and we had to drive by him hoping he would not see us. We waited down the road for 2 or 3 minutes and he did not go by us, so we guessed that he had backtracked, we took off again, this time just guessing as to which way he had gone. On Interstate Highway 890 at speeds of 80+ mph (closer to 100 mph) we spotted our suspect. Coming upon his rear bumper just as he started to play some music. Both of our radios which were listening on 146.31 came alive with S meter readings, pinning and 2 seconds later K1FFK keyed on repeating the music. The H.T. which was listening on 146.91 DESENSED and our field strength meter pinned. Our suspect or should I say our Burper (now we were positive as to who it was) spotted us and stopped transmitting. Dick WA2CSQ transmitting on 146.91 told him to "Give it up..." At this point he knew that he had been caught with his mike down. We followed him to his place of employment where in the parking lot we confronted him and he admitted he was wrong and we got the whole QSO on tape.

I would like to thank Dick for his efforts, the use of his car, radios, tape recorder and driving skills without which we would still be listening to urpppppps at 6:00 AM every morning. Also a big thank you to Peg for going along with us.

EPILOG: The Burper who is known by many people and well liked by many, has been a ham for many years (like 30) is an official O.O. for the ARRL and had important positions with RACES and other organizations. The one thing that we learned from this is, hams *can* police other hams. So effective was our capture that the Burper has sold or is in the process of selling his 2 meter gear. I hope his capture helped him and maybe someday he will get back on 2 meters and rejoin his *Friends* who were only trying to keep things as they should be.

de WA2PVV

Caveat Emptor?

Price – $2 per 25 words for non-commercial ads; $10 per 25 words for business ventures. No display ads or agency discount. Include your check with order.

Deadline for ads is the 1st of the month two months prior to publication. For example: January 1st is the deadline for the March issue which will be mailed on the 10th of February.

Type copy. Phrase and punctuate exactly as you wish it to appear. No all-capital ads.

We will be the judge of suitability of ads. Our responsibility for errors extends only to printing a correct ad in a later issue.

For $1 extra we can maintain a reply box for you.

We cannot check into each advertiser, so Caveat Emptor . . .

WANTED: Hallicrafters Model T-54 7" television in metal cabinet, made 1948-1949 need not be working, but complete. Wayne LeTourneau WB0CTE, 2338 E. South Ave, No. St. Paul MN 55109.

TECH MANUALS for govt. surplus gear – $6.50 each: R-390/URR, R-220/URR, URM-25D, CV-591A/URR, CV-278/GR, TRM-1, TS-382D/U, TS-497B/URR, TT-63A/FGC, URM-32. W3IHD, 7218 Roanne Drive, Washington DC 20021.

LEARN DESIGN TECHNIQUES Electronics Monthly Newsletter. Digital, linear construction projects, design theory and procedures. Sample copy $1.00. Valley West, Box 2119-E, Sunnyvale CA 94087.

MIX PLEASURE with pleasure at the Hamburg International Hamfest on Sept. 21. For information contact Lin Brownell WB2HCL, 210 Buffalo, Hamburg NY 14075

AUTOMATIC TELEPHONE answering computer. The best available. List $239.95. I have two new and still in boxes for $150.00 each. Warranty is still good. First check takes one or both. WB8CTA, 1000 Moore Road. Conway MI 49722.

WYOMING RANCH LAND. No QRM-QRN. Wild horses, antalope, deer. 10 acres – $25 down, $25 monthly. Owner – Michael Gauthier K6ICS, 9418 Florence, Downey CA 90240.

BUY-SELL-TRADE Write for monthly mailer. Give name address call letters. Complete stock of major brands new and reconditioned equipment. Call us for best deals. We buy Collins, Drake, Swan, etc. SSB and FM. Associated Radio, 8012 Conser, Overland Park KS 66204. 913-381-5901.

FOR SALE: New Drake R4-C with 4N.B, AM-filter package $600.00. Call Jim W1VYB (617) 922-3850.

JULY ISSUE of 73 Magazine introduced new Keeps It Kits. Now, good news: if a "U" shaped bracket mounts your rig, protection available with kit, regardless of make!! Basic concepts unchanged. Order today. Free bonus: include call sign and receive attractive engraved call plate.

MOBILE IGNITION shielding gives more range, no noise. Everything from economical suppression kits to custom shielding, literature Estes Engineering, 543-A West 184 Street, Gardena CA 90248.

FOUNDATION for Amateur Radio annual hamfest Sunday, October 20, 1974 at Gaithersburg Maryland Fairgrounds.

MOTOROLA PORTABLES Expert repairs, reasonable prices, fast turnaround time. More details and flat rate catalog FREE. Ideal services, 6663 Industrial Loop, Greendale WI 53129.

MASSACHUSETTS HAMS! Large supply of two meter crystals and accessories in stock. Authorized distributor for ICOM, Standard and Genave radios. Kensco Communications Inc., 46 Pearl Street, Quincy MA 02169 (617) 471-6427 (only 10 miles south of Boston).

HW101, SB600, HP23A: First money order or cashiers check for $330.00, will ship UPS postage collect. 73 Magazine, Peterborough NH 03458.

FREE: 12 extra crystals of your choice with the purchase of a new Regency HR-2B at $229. Send cashier's check or money order for same-day shipment. For equally good deals on Collins, Drake, Kenwood, Standard, Clegg, Swan, ICOM, Genave, Hallicrafters, Tempo, Midland, Ten-Tec, Venus Hy-Gain, CushCraft, Mosley, and Hustler, write to Hoosier Electronics your ham headquarters in the heart of the Midwest. Become one of our many happy and satisfied customers. Write or call today for our low quote and try our individual, personal service. Hoosier Electronics, R.R. 25, Box 403, Terre Haute IN 47802. (812) 894-2397.

CALCULATOR OWNERS: Use your +-x÷ calculator to compute square roots, cube roots, trigonometric functions, logarithms, exponentials, and more! Quickly, accurately, easily! Send today for the IMPROVED AND EXPANDED EDITION of the First and best calculator manual – now in use throughout the world. . .still only $2.00 postpaid with unconditional money - back guarantee! Mallmann Optics and Electronics, Dept. -E6, 836 South 113, West Allis, Wisconsin 53214.

GRAND RAPIDS SWAPFEST September 21, 8:00AM Hudsonville Fairgrounds, M-21 at 40th three blocks west of Hudsonville traffic light. $1.75 admission, no charge for tables and trunk sales.

FOR SALE Thriving 2-way business in medium size Midwest market, $40,000.00 annual gross. For further information write c/o Box J, 773.

FCC LICENSING and Electronics Courses Offered. Beginning September 7, 1974 the Hall of Science of the City of New York will offer 12 week courses on consecutive Saturday mornings for Novice, Technician, General and Advanced Class FCC Licenses. Beginning September 12, 1974 a 12 week course on Basic Solid State Electronics will be offered on consecutive Thursday Evenings and will instruct in basic components and circuits in solid state devices used in radio, television, stereo and other audio and radio frequency equipment. Licensing Course fee $8.00. Electronics Course fee $15.00. Write P.O. Box 1032, Flushing, New York 11352 or phone 212-699-9400 for information.

PERSONAL ATTENTION plus the best cash deal anywhere is what you receive at QUEEN CITY ELECTRONICS in the heart of the Midwest. Queen City carries all major brands including Drake, Tempo, Kenwood, Yaesu, Swan, Regency, Clegg, Standard, ICOM, Genave. . . . write or phone us for your equipment needs. Queen City Electronics, Inc., 7404 Hamilton Avenue, Cincinnati, OH 45231 (513) 931-1577.

COLLINS 75S-3C round emblem mint condition $670. Ship prepaid UPS or trade for Drake 4B line – Larry Skibicki WA2FQH 89-38 188 St. Hollis NY 11423 (212) 454-1369.

YOUR SWAP-N-SELL ads run free in TRADIO, a public service publication of Wichita Amateur Radio Society Box 4391 Wichita Falls TX 76308.

YAESU FT-101 cooling fan, Rp speech compressor. Very clean. $465 or best offer. FOB WA4SCA/5, 116 Harrold Street, Jacksonville AR 72076.

ELECTRONIC SURPLUS – resistors 1/4 and 1/2 watt 5¢, capacitors 10¢, tube and solid state components. Catalog 10¢. SASCO Electronics, 1009 King St., Alexandria VA 22314.

CRYSTALS! CRYSTALS! Crystals! Over 8,000 2 meter crystals in stock for all popular 2 meter FM radios Orders for in-stock crystals shipped the same day. Please specify make, model and exact frequency desired. Our guaranteed crystals are $3.95 each prepaid anywhere in the United States. We welcome any order of 1 to 1,000. Order today from the crystal headquarters of the Midwest – Hoosier Electronics, R.R. 25, Box 403, Terre Haute IN 47802. (812) 894-2397.

JIG SAW PUZZLES wanted. If you have any old wooden jig saw puzzles in your attic – or run across them at an auction (they go for 25¢ usually), please keep in mind that Wayne Green collects them and might even pay a buck a peice for them. c/o 73 Magazine, Peterborough NH 03458. Wood, not cardboard – and complete.

CALL LETTER LICENSE PLATES – still being collected by 73 Magazine for possible cover use. Please send in an old call letter plate – most treasured are out-of-district plates such as W2NSD/NH, etc. Got any real oldies? 73 Magazine, Peterborough NH 03458.

FOR SALE: New SB144-$178.00, new HR212-$200.00, Factory reconditioned Pearce Simpson Gladding 25-$180.00, Beckman 8060AR Electronic Counter with manual. . .best offer or will trade. . .call Rick Harris 912-226-5360.

VERY INTERESTING! Next 5 issues $1. "The Ham Trader," Sycamore Il 60178. (Ask about our "HAM EQUIPMENT BUYERS GUIDE" covering Receivers, transmitters, transceivers, amplifiers 1945–74. Indispensable!)

HEATH SB110, SB-620, Gonset Communicator III 2 meters and 6 meters, VHF P.A., TTL/2. Reasonable. Charles Ausberger, KBILR, 907 West Houghton Avenue, West Branch MI 48661.

FOR SALE -- TV-7B Tube Testers. Some need repairs. $16.95. Shipped UPS collect. NJ residents include 5% sales tax. Capacitor Materials Inc., PO Box 413, West Long Branch NJ 07764.

HAMMARLUND HQ-170AC-VHF with IF noise immunizer $300.00. Heath HO-13 panoramic adapter $50.00, HO-10 monitor scope $50.00. WA3OBW, Phila PA 215-HO2-9293.

SOCIAL EVENT

BERMUDA Oct 13-20

This is amateur radio week in Bermuda. Oct. 16th: annual meeting of the Radio Society of Bermuda. Oct 18: annual RSGB dinner at Holiday Inn, St. Georges honoring the winners of the Bermuda Contest. Oct 19 20 portable operation of VP9BS in the Scout Jamboree. To get a license to operate in Bermuda write to the Radio Society of Bermuda, Box 275, Hamilton Bermuda. Travel and lodging should be arranged with your local travel agent.

LAST MINUTE FCC RELEASES

In the matter of

Authorization of commemorative stations in the Amateur Radio Service.

Docket No 20111

NOTICE OF PROPOSED RULE MAKING

Released: July 24, 1974
By the Commission: Commissioner Lee concurring in the result: Commissioners Quello, Washburn and Robinson not participating.

1. Notice of Proposed Rule Making in the above captioned matter is hereby given.

2. The Commission in this action is proposing to adopt rules which will liberalize and clearly delineate the provisions under which amateur operators may obtain a commemorative station license. Under the present rules and policies, a special event authorization is issued only when an applicant can show the event is of general public interest of at least a statewide basis. Many applicants have been unable to meet this criteria even though the event may have been very significant to a particular group of people.

3. To alleviate this problem, our proposed rules would establish a new class of amateur station, i.e., commemorative station, which would be issued for any celebration that is either unique, distinct and of general interest to the public or amateur operators. The primary purpose of this station would be to bring public notice to the Amateur Radio Service by allowing an amateur station with a distinctive call sign to be operated at an event or celebration so as to help attract more contacts.

4. The specific licensing requirements for a commemorative station are set forth in the Appendix in §97.41. Essentially stated, an Amateur Extra or Advanced Class licensee will be allowed to file an application in letter form for a commemorative station, giving the details of the authorization desired. While our proposed rules would permit the use of multiple transmitters at a station, portable or mobile operations would be prohibited. A commemorative station will not be licensed for any amateur operating contest.

5. The effect of our proposed rules is to remove authorizations for commemorative stations from the category of Special Temporary Authorization. Under our proposed rules, they would constitute a formal class of amateur station and thus the usual application fees will be imposed. The regular new station application filing fee would be required, and in addition, if a specific call sign is requested, the usual special call sign fee would be required. We believe that the imposition of these fees is appropriate in view of the amount of processing time involved with these applications.

6. Authority for the proposed rule changes herein is contained in Sections 4(i) and 303 of the Communications Act of 1934, as amended, and Title V of the Independent Offices Appropriations Act of 1952.

7. Pursuant to applicable procedures set forth in §1.415 of the Commission's Rules, interested persons may file comments on or before October 30, 1974 and reply comments on or before November 16, 1974. All relevant and timely comments and reply comments will be considered by the Commission before final action is taken in this proceeding. In reaching its decision on the rules which are proposed herein, the Commission may also take into account other relevant information before it, in addition to the specific comments invited by this Notice.

8. In accordance with the provisions of §1.419 of the Commission's Rules and Regulations, an original and 14 copies of all comments, pleadings, briefs, or other documents shall be furnished the Commission.

9. All filings made in this proceeding will be available for examination by interested parties during regular business hours in the Commission's public reference room at its headquarters in Washington, D.C., (1919 M Street, N.W.)

APPENDIX

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended as follows:

1. §97.3(i) is amended to add a new definition "Commemorative station" immediately after Repeater station to read as follows:

§97.3 Definitions.
(i) * * *
Repeater station.
Commemorative station. Station licensed at a specific land location for operation in commemoration of a celebration which is unique, distinct, and of general interest to either the public or to amateur radio operators, for the purpose of bringing public notice to the Amateur Radio Service.

2. §97.40(c) is amended to read as follows:

§97.40 Station license required.

(c) An amateur radio operator may be issued one or more additional station licenses, each for a different land location, except that repeater station, control station, auxiliary link

Cont'd

station, and commemorative station licenses may be issued to an amateur radio operator for land locations where another station license has been issued to the applicant.

3. Sections 97.41(a) and 97.41(g) are amended and §97.41(f) is added to read as follows:

§97.41 Application for station license.

(a) Each application for a club or military recreation station license in the Amateur Radio Service shall be made on the FCC Form 610-B. Each application for any other amateur radio license, except a commemorative station, shall be made on the FCC Form 610.

(f) An application by letter to the Amateur and Citizens Division, Federal Communications Commission, Washington, D.C. 20554, may be made by an Advanced Class or Amateur Extra Class licensee for one commemorative station for the period of the celebration, but not to exceed 30 days unless extraordinary circumstances are shown. The request letter shall contain the following:

(1) The name, mailing address, photocopy of amateur operator license, and signature of applicant.

(2) The name and description of the celebration, its significance to the public or to amateur radio operators, and the justification for the proposed commemorative station.

(3) The location of the proposed station.

(4) The dates the station will be operated, and justification.

(5) Specific call sign requested, if desired.

(g) One application and all papers incorporated therein and made a part thereof shall be submitted for each amateur station license. If the application is only for a station license, other than a commemorative station, it shall be filed directly with the Commission at its Gettysburg, Pennsylvania office. If the application also contains application for any class of amateur operator license, it shall be filed in accordance with the provisions of §97.11.

4. §97.51(a)(4) is amended to read as follows:

§97.51 Assignment of call signs.

(a) * * *

(4) A specific unassigned call sign may be temporarily assigned to a commemorative station.

5. In §97.95 the headnote is revised and §97.95(a)(i) is amended to read as follows:

§97.95 the Operation away from the authorized fixed operation station location.

(a) * * *

(1) When there is no change in the authorized fixed operation station location, an amateur radio station other than a military recreation, auxiliary link, or commemorative station, may be operated under its station license anywhere in the United States, its territories or possessions, as a portable or mobile operation, subject to §97.61.

In the Matter of

Amendment of Part 97 regarding the automatic control of repeater stations in the Amateur Radio Service.

Docket No. 20112

NOTICE OF PROPOSED RULE MAKING

Released: July 25, 1974

By the Commission: Commissioners Washburn and Robinson not participating.

1. Notice of Proposed Rule Making is hereby given in the above entitled matter.

2. The Commission is considering amendments to the rules for the Amateur Radio Service to provide for automatic control of repeater stations. Every amateur radio station, including all repeater stations, has always been required to have a control operator at an authorized control point when in operation. In the Report and Order, in Docket 18803, 37 FCC 2d 225 (1972) we predicted advancements in amateur remote control and automatic control would necessitate further rule making in the matter of repeater control. Interested parties having information and suggestions in these areas were urged to submit them to us for consideration. We are appreciative for the helpful response from those amateurs and organizations doing so. In particular, we are grateful to several amateur licensees for their experiments in semi-automatic and automatic repeater control, and to the American Radio Relay League for their suggestions. This information, together with our awareness of the vast improvement in the amateur remote control methods in recent months, leads us to believe there is an appropriate basis for moving forward in this area.

3. By the term control, as used herein, we mean the techniques for accomplishing the prerequisite responsibility for the proper operation of an amateur radio station in compliance with the rules. A control operator, whether or not the station licensee, at a control point located adjacent to the station transmitter, in the classic concept of amateur radio operation is performing local control. If he is at a distant control point, he is performing his functions by remote control through operator on duty at all times is used to control a station, we consider this to be automatic control. Only repeater stations and auxiliary link stations used in repeater systems are being proposed for automatic control in the Amateur Radio Service.

4. Because of the unique privileges authorized, there are special responsibilities incumbent upon the licensee and the control operator of remotely controlled stations and repeater stations. Unlike most other radio services, we do not assign specific operational frequencies to amateur stations. All amateur frequencies are available, depending upon one's operator license class, on a first come, first served basis. Most of these frequencies must be shared by amateurs throughout the world, using all types of emissions, for a variety of amateur purposes. Moreover, some frequencies must be shared with non-amateur stations. The fundamental means for making such a system practical is that the control operator of each amateur station selects any specific operating frequency by first determining there are no communications already thereon. In the event there are, he either waits for that frequency to clear, or moves to an unoccupied frequency. Indiscriminate frequency selection can result in non-compliance with §97.125 which prohibits deliberate interference. While there may be some advantages in discontinuing this system in favor of frequency assignments for repeaters, and possibly other kinds of amateur stations, we believe the traditional method continues to be the best one for the Amateur Radio Service. Coordination of operating frequencies among amateurs is necessary, however, to make the most effective use of the allocated bands. Licensing a station for remote control does not imply any less control is required. The basic premise for permitting remote control of an amateur radio station is that amateur technology is adequate to provide the same degree of control over a remotely controlled station, in so far as compliance with the rules is concerned, as does local control.

5. In most amateur repeater stations which have come to our attention, efficient operation has been achieved through persistent self-enforcement efforts by the amateurs involved. Unfortunately, for a few stations this is not the situation. The control operator of a repeater station has additional responsibilities even beyond those incombent upon the control operator of a non-repeater station. He has the job of screening out prohibited practices, such as

More, more...

music, broadcasting, commercial traffic, etc. While the repeater may not be the originator of these types of transmissions, the repeater station licensee and control operator are nonetheless responsible for the proper operation of the station. They must receive a high degree of cooperation from other amateurs making use of the station, in order to make repeater stations in the Amateur Radio Service practical. While the control operator must make certain that other radio signals, either amateur or non-amateur, not intended for retransmission are not repeated, it should be obvious to all amateurs that transmissions in the repeater segments of the amateur frequency bands should be limited to those intended to be retransmitted. This is particularly true for transmissions in the frequency regions where the generally accepted repeater input channels are situated, such as 146.01 – 146.46 MHz and 147.60 – 147.99 MHz. Stations conducting simplex communications on these frequencies in areas where their transmission could be repeated should expect them to be repeated.

6. Some amateurs have developed a number of techniques to relieve the control operator from personally performing many routine contro functions. For instance, several remotely controlled repeater stations use devices to disable the repeater transmitter in order to prevent interference to other stations already transmitting on the frequency. Other repeaters use secondary control systems, ranging from simple to complex, to limit access to the repeater to users of their choice. Still others use devices to monitor the technical performance of the station, which automatically shuts down the station if it is not within the desired standards. An automatic recorder is often used for logging third party traffic activity. The use of such techniques appear to make automatic control of an amateur repeater station practical. This is being domonstrated under Special Temporary Authorization by several amateur repeater stations.

7. In some, if not most, amateur repeater stations, where full cooperation by the users is obtained, the control operator's function is usually completely passive. He only needs to monitor the communications to verify the continuing proper operation of the station. We suspect, in such instances, the necessity for real time monitoring by a control operator may be unnecessary. These stations can operate properly under automatic control, with the monitoring accomplished on a delayed basis. Regrettably, from the types of problems encountered by some repeater stations that have come to our attention, it is apparent that not all repeater stations would be able to operate by automatic control at all times. Where the equipment is not sufficiently reliable to leave unattended, or where the necessary automatic functions are not incorporated, or where full cooperation by the users is not obtained, automatic control is not practical. For these stations, operation by local control or remote control is the only practical means, at least during certain time periods when the violations would otherwise occur.

8. Therefore, we are proposing to expand the definitions in §97.3(n), as shown in the Appendix, to include automatic control, in addition to local and remote control. Automatic control would only apply to repeater stations as described in the foregoing, and to certain auxiliary link stations used in conjunction with repeater stations under this type of control. New §97.110(c) and §97.111(g) would be added to provide for these new types of control.

9. In order to operate a repeater station by automatic control, the station would first be licensed as a repeater station, in the conventional manner, for either local control or for remote control. Specific authorization

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for automatic control would not be required. However, certain privisions must be effected, as set forth in detail in the Appendix. These include a requirement that sufficient information must be filed with the Engineer in Charge to enable him to order a station shutdown should the need arise. The control operator designated by the repeater station licensee must be available on call at all times the station is under automatic control. All radio communications through an automatically controlled repeater must be recorded and reviewed within 72 hours by the control operator(s), for rule compliance. In the event violations did occur, the licensee would be obligated to take the steps necessary to prevent a recurrence, or else may only operate the station by local or remote control. Should the improper operation of a repeater station while under automatic control come to our attention, we would then impose restrictions against further automatic control of that station until such time as the licensee can show that future operation of the station by such control will result in compliance with the rules.

10. Depending upon the actual situation, there are several steps the licensee of a repeater station desiring to operate his station by automatic control can take to preclude many of the abuses encountered with amateur repeaters. For instance, if commercial third party traffic by automatic telephone system interconnect becomes a problem, this function could be discontinued during periods of automatic control. The repeater might have to be restricted to only emergency communications, if other means to secure the cooperation of all users are not successful. Possibly, the repeater could only be operated by automatic control during certain periods each day, such as during the late night hours. Another method is to employ a semi-automatic control system, where access to the repeater is only possible for those users selected by the station licensee. Undoubtedly, the imagination and ingenuity of amateurs can devise even more methods to solve these and other problems. However, proper operation of a repeater station by automatic control would always depend heavily upon cooperation from others. The self-policing claims and reputation long associated with amateurs would be thoroughly tested by this proposed method of repeater control.

11. The specific rule changes proposed herein are set forth in the attached Appendix. Authority for these proposed amendments is contained in Section 4(i) and 303 of the Communications Act of 1934, as amended.

12. Pursuant to applicable procedures set forth in §1.415 of the Commission's Rules, interested persons may file comments on or before October 30, 1974, and reply comments on or before November 16, 1974. In accordance with the provisions of §1.419(b) of the Commission's Rules, an original and fourteen copies of all statements, briefs, and comments filed shall be furnished the Commission. All relevant and timely comments and reply comments will be considered by the Commission before final action is taken. The Commission may also take into account other relevant information before it, in addition to specific comments invited by this Notice. Responses will be available for public inspection during regular business hours in the Commission's Broadcast and Docket reference Room at its Headquarters in Washington, D.C.

APPENDIX

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended as follows:

o. §97.3(n) is amended to read as follows:

§97.3(n) Definitions

(n) Control. Techniques for accomplishing the prerequisite responsi-

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Docket 20112 - More!

bilities in the immediate operation of an amateur radio station. Must be one or more of the following:

Local Control. Manual control, with the control operator monitoring the operation on duty at the control point located at the station transmitter(s), such that the associated operating adjustment are directly accessible. (Direct mechanical control, or direct wire control of a transmitter from a control point located on board any aircraft, vessel, or on the same premises on which the transmitter(s) is located, is also considered local control).

Remote Control. Manual control, with the control operator monitoring the operation on duty at a control point located elsewhere than at the station transmitter(s), such that the associated operating adjustments are accessible through a control link.

Automatic Control. The use of devices and procedures for control such that the duty control operator does not have to be present at the control point at all times. (Only rules for automatic control of repeater station systems have been adopted. Automatic control of all other types of amateur radio stations must be approved by the Commission on a case-by-case basis).

2. §97.79(b) is amended to read as follows:

§97.79 Control operator requirements.

(b) Every amateur radio station, when in operation, shall have a control operator. The control operator shall be on duty at an authorized control point, except where the station is under automatic control. The control operator may be the station licensee, if a licensed amateur radio operator, or may be another amateur radio operator with the required class of license and designated by the station licensee. The control operator, when on duty, shall also be responsible, together with the station licensee, for the proper operation of the station.

3. Add new §97.110(c) to read as follows:

§97.110 Operation of an auxiliary link station.

(c) An auxiliary link station(s) licensed either for local control or for remote control, may also be operated under automatic control when it is licensed in a repeater station system being operated under automatic control. Both the auxiliary link stations(s) and the repeater station must appear on the system network diagram on file with the Commission.

4. Add §97.111(g) to read as follows:

§97.111 Operation of a repeater station.

(g) A repeater station licensed either for local control or for remote control, may also be operated under automatic control. Both the auxiliary link stations(s) and the repeater station must appear on the system network diagram on file with the Commission.

4. Add §97.111(g) to read as follows:

§97.111 Operation of a repeater station.

(g) A repeater station licensed either for local control or for remote control, may also be operated under automatic control where:

(1) Devices and procedures have been implemented such that compliance with the rules can be accomplished without the duty control operator present at the control point at all times the station is in operation.

(2) All radio communications transmitted by the station are monitored by the duty control operator in real time, or reviewed within 72 hours. In the event a violation is detected, the repeater station licensee must take the necessary steps to prevent a recurrance.

(3) All radio communications transmitted by the station are recorded such that they can be reproduced. The recordings shall be:

(i) Preserved for a period of at least 30 days,

(ii) Retained in the possession of the station licensee, and

(iii) Made available to the Commission upon request.

(4) The name of the station licensee, and the names of designated control operators, together with appropriate information so the duty control operator may be readily notified by Commission personnel to effect a prompt shutdown of the station, has been filed with the Engineer in Charge of the radio district in which automatic control of the station(s) is intended. This notification shall have been filed within the past year, or at the time of any change thereto, whichever is most recent.

(5) Upon notification from the Engineer in Charge, or other Commission Representative, of improper station operation under automatic control, said operation must be immediately discontinued until all deficiencies have been corrected and the Commission so notified. Otherwise, the station(s) may only be operated under local control, or under remote control if authorized.

In the Matter of

Amendment of Part 97 of the Commission's Rules to permit crossband operation or repeater stations.

Docket No. 20113
RM-2327

NOTICE OF PROPOSED RULE MAKING

Released: July 24, 1974

By the Commission: Commissioners Washburn and Robinson not participating.

1. Notice of Proposed Rule Making in the above-entitled matter is hereby given:

2. The Commission has under consideration a petition (RM-2337) filed by the American Radio Relay League (ARRL). Petitioner requests the Commission to issued an Order modifying the second sentence of §97.111(c) so as to permit repeater stations to be operated crossband, i.e., permit a repeater station to utilize an output (transmitter) frequency within a different frequency band than the input (receiving) frequency. The present rule requires both the input and output be within the same frequency band.

3. The ARRL suggests that a formal rule making proceeding is unnecessary for the proposed amendment since it would provide a relief from a present restriction. Although no specific statuatory authority is cited, peitioner must reply upon §553(b) of the Administrative Procedure Act, 5 U.S.C., and §1.412(c) of the Commission's Rules, as authority to support his position. Pursuant to those subsections, general notice of proposed rule making must be published except in certain limited instances. Petitioner does not show that the proposed rule modifications comes within those exceptions, and we do not believe any such exception could apply. Moreover, even if we put aside the requirements of the §553(b) and further assume arguendo that every amateur licensee who operates or is interested in amateur repeater stations favors this proposed rule amendment, it is possible that this change will adversely affect the interests of other amateur operators, and they should be allowed to comment and express their views.

4. In support of the requested amendment, the ARRL offers the following claims and arguments:

A. Crossband operation of a repeater station having, for example, an input frequency in the 146-148 MHz band and an output frequency in the 222-225 MHz band, could reduce the costs of repeater stations and make more channels available. Repeaters using the wider frequency separation between the input and the output could benefit greatly through the alleviation of a receiver desensitization problem, a difficult one for

Docket 20113 more...

amateurs to solve without considerable expense. Moreover, the present number of repeater input channels could be greatly expanded through the use of narrower channel spacing in the 146-148 MHz band, together with repeater input receivers with the necessary selectivity. Wider channel spacing of the repeater 222-225 MHz output channels would still permit the use of low cost mobile and hand-held units because of the relatively less selectivity required in the receiver section.

B. More efficient use of the spectrum could result. Crossband operation could make the use of other bands more practical, particularly in the frequency band 1215-1300 MHz.

C. Crossband operation of repeaters would permit amateurs to experiment with more sophisticated communications and new control procedures.

5. The request presented by the ARRL may have some merit. Our reason for the adoption of the rule prohibiting crossbanding, as stated in the Report and Order in Docket 18803, was to conserve frequency spectrum. The ARRL scheme for repeater stations to crossband a single channel would still only require one frequency pair, the same as required for a repeater not crossbanded. Their plan to use crossbanding as a means to provide more repeater channels within the same frequency segments would be an improvement in terms of spectrum conservation insofar as repeaters are concerned. How widely this scheme will be accepted by amateurs remains to be seen, since it could require substantial modifications to existing equipment. Also, it would probably result in the discontinuation of simplex segments in the repeater bands, which would not be an improvement in spectrum conservation. Furthermore, it is doubtful whether the costs saved in duplexing equipment would even be offset by the costs required to retrofit all of the users' equipment. It would appear that the more typical application of crossbanding, at least for the near future, would be the addition of one or more input and output frequency channels to an existing repeater. For example, a frequency pair in the 442-450 MHz repeater band might be added to an existing repeater already operating in the 146-148 MHz band. There would then be the capability for an amateur using a 146-148 MHz transceiver to communicate with another amateur using a 420-450 MHz transceiver by means of the crossband repeater. In densely populated areas, the additional unoccupied frequency pairs required may not be available, as pointed out by the ARRL. However, in less populated areas, they would be available, and it is in these areas that crossbanding would have its greatest appeal.

6. Amateur repeater stations, at least as they are presently used, fundamentally provide a party line type of operation. That is, only one user can be retransmitted at a time while all others wait their turn. Consequently, there is a limit on the number of users any one repeater can accommodate, regardless of whether the repeater utilized 1, 2, 3, or more frequency pairs. As the limit is approached, user time would become so minimal and waiting time would become so excessive, in most instances it would become a necessity to terminate crossband operation in favor of independent repeaters. For this reason, we suspect there may be no need for the prohibition against crossband operation.

7. Crossband operation by repeater stations would be limited to those frequency bands authorized for repeater operation. New §97.126 in Subpart E, Prohibited Practices and Administrative Sanctions would incorporate the current policy on other types of retransmissions. Only repeater stations, auxiliary link stations, and certain remotely controlled stations are licensed to automatically retransmit the radio signals of other amateur stations. By the term automatic retransmit, we mean retransmitting other signals in real time or very near real time. The best example of this is the type of retransmission performed by amateur repeater stations. An example of a prohibited practice would be the retransmission on the 14.0-14.35 MHz amateur band of another amateur station transmitting on the 144-148 MHz band, or vice versa. However, it is completely proper for an amateur operator at one station to receive a message from another station, and then later send the same message to a third station, such as done in many amateur traffic networks.

8. Authority for the proposed rule changes herein is contained in Sections 4(i) and 303 of the Communications Act of 1934, as amended.

9. Pursuant to applicable procedures set forth in §1.415 of the Commission's Rules, interested persons may file comments on or before October 30, 1974 and reply comments on or before November 16, 1974. All relevant and timely comments and reply comments will be considered by the Commission before final action is taken in this proceeding. In reaching its decision on the rules which are proposed herein, the Commission may also take into account other relevant information before it, in addition to the specific comments invited by this Notice.

10. In accordance with the provisions of §1.419 of the Commission's Rules and Regulations, an original and 14 copies of all comments, pleadings, briefs, or other documents shall be furnished the Commission.

11. All findings made in this proceeding will be available for examination by interested parties during regular business hours in the Commission's public reference room at its headquarters in Washington, D.C., (1919 M Street, N.W.)

APPENDIX

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended as follows:

1. §97.111(c) is revised to read as follows:

§97.111 Operation of a repeater station.

(c) A repeater station may concurrently retransmit amateur radio signals on more than one frequency band authorized for repeater stations, but may not concurrently retransmit on more than one frequency channel within the same frequency band. A repeater station authorized to operate in conjunction with one or more auxiliary link stations for relaying radio signals, received at another location(s), to the repeater station may utilize input (receiving) frequencies not available for repeater stations, provided the input frequencies to the auxiliary link station(s) are in frequency bands authorized to repeater stations.

2. New §97.126 is added to read as follows:

§97.126 Retransmitting radio signals

No amateur radio station, except a properly licensed repeater station, auxiliary link station, or a remotely controlled station in a system with an auxiliary link station, may automatically retransmit the radio signals of other amateur radio stations.

Please send copies of your comments on these Dockets to 73 Magazine, Peterborough NH 03458.

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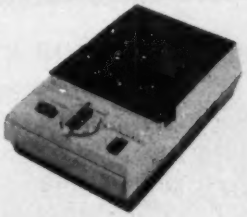

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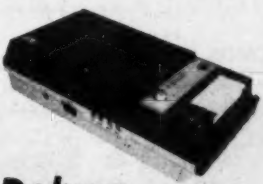

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74C74	1.25	CD4017	3.20	**LINEAR**	
74C76	1.75	CD4018	3.25	LM301M	.45
74C107	1.75	CD4019	1.25	LM311M	1.20
74C151	3.30	CD4020	5.50	LM318	1.75
74C160	3.25	CD4021	4.00	LM339	2.00
74C161	3.25	CD4023	.60	LM370	1.25
74C162	3.25	CD4024	3.00	LM371	1.25
74C163	3.25	CD4025	.60	LM372	1.25
74C195	3.15	CD4027	1.75	LM374	2.00
CD4001	.60	CD4029	6.00	LM380	1.65
CD4002	.60	CD4030	.60	LM381	1.75
CD4008	4.00	CD4035	2.50	LM382	1.75
CD4009	.95	CD4037	2.95	LM399	1.75
CD4010	.95	CD4040	5.00		

555	1.00
556	1.60
723T	.95
723D	.75
741M	.45
741T	.50
747D	.85
748M	.65
1595	1.50
1596	1.75
CA3028	.75
CA3065	.75
CA3086	.45
3900	.75
4136	2.00
4250T	2.25
5556M	1.50
5558	.90

ALL ITEMS IN STOCK and will be shipped within 24 working hours of receipt of order!

Include 50¢ postage and handling on orders under $10.00

Sorry, NO C.O.D.'s. CALIFORNIA RESIDENTS ADD sales tax.

2 METER FM HEADQUARTERS

Only STANDARD sells more STANDARDS than .....ERICKSON!

and here's ANOTHER ERICKSON SPECIAL

SRC–826 MA

A better BEST BUY than ever . . . . . .

OUR DEAL:	
826 MA list	**$398.00**
+ 16 extra xtals	**80.00**
Package list price	**$478.00**
You pay only	**$359.00**
YOU'VE SAVED	**$119.00**

YOU GET *Standard's 826MA, the best 12-channel 10-watt solid state rig on the market, factory set up on four channels plus crystal coupons for eight more channels (16 of Standard's lifetime Astropoint crystals!) of your choice; with helical-resonator front end receiver, built in provision for tone–coded squelch, rear panel test point/monitor/control sockets – all in one compact, reliable package* – **at a GIANT $119 ERICKSON saving ! !**

Shipping prepaid for cashier's check or MO.

Handheld Special

SRC–146A with:

- Deluxe basecharger
- "Stubby" antenna
- Leather case
- Ni-cads
- 94/94, 34/94 and one other channel of your choice

List Price	**$369.00**
Our Price	**$319.00**
YOU SAVE	**$50.00 ! !**

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SEND QSL FOR COMPLETE SPECIFICATIONS

ERICKSON COMMUNICATIONS

3501 W. Jarvis, Skokie, IL 60076 (312) 677-2161

DuPage FM

WILL NOT BE UNDERSOLD!

HOME BREWERS TAKE NOTE OF THIS BARGAIN POWER SUPPLY SPECIAL:

MANUFACTURERS OVERRUN – BRAND NEW TRANSISTOR POWER SUPPLIES

These are brand new, in the original factory package. We cannot advertise the name, but you will recognize it immediately. The output voltages are changeable by changing a jumper.

Keyed outputs:	675 v @ 135 mA or	400 v @ 150 mA or	400 v @ 130 mA
	275 v @ 40 mA	275 v @ 40 mA	275 v @ 170 mA
Bias	-40 v @ 25 mA	-40 v @ 17 mA	-40 v @ 20 mA
Fixed outputs:	250 v @ 25 mA	275 v @ 27 mA	275 v @ 39 mA
	150 v @ 30 mA	150 v @ 30 mA	150 v @ 30 mA

Output connections are terminated in a multipin plug. Brand new with schematic (shipping weight 10 pounds) $20.00 each – 5 for $90.00

New battery cables for above, includes "A" relay (shipping weight 3 pounds) $3.00 each 5 for $12.00

New output cables for above. Connector mates with output connection on power supply. (shipping weight 6 pounds) $4.50 each 5 for $20.00

TONE SIGNALING EQUIPMENT:

SECODE digital decoder. Made by Secode for RCA mobile units. Decodes a pulsed tone to activate any function you choose. Most are brand new. $15.00 each 10 for $125.00

SECODE Call Heads: Used with above decoder to indicate that a call has been received and not answered; Used. $1.50 each 10 for $12.00

SECODE: Model SD-30 call heads – Contains decoder and call indicator. 12 volt input. Most are brand new in original factory packages. $50.00 each (shipping weight 4 pounds).

BRAMCO – Two tone sequential decoders for mobile use. These are compatible with Motorola Quick-Call systems. Brand New, most in original factory packages. (shipping weight 4 pounds) Each $45.00

BUY OF THE YEAR: RCA Scanning Control heads. Scans four channels, reverts to a selectible priority channel. Requires 12 volts DC and unfiltered audio from the discriminator. LED's indicate the channel being received. Schematic included. (shipping weight 7 pounds) Used – each $75.00

COMING ATTRACTIONS: We expect a large quantity of Motorola HT-200's on the 450 mc band. If you are interested send a post card with your name, address and telephone number. When they arrive we will call you to advise condition, price and options available.

TWO METER SPECIAL: RCA Model CMCT-30 – transistor power supply, partially transistorized receiver, 30 watts output. With trunk mount accessories. Regularly $100.00, for September only – each $85.00.

DU PAGE FM INC. P.O. Box 1 Lombard, Ill. 60148

(312) 627-3540

TERMS: All items sold as is. If not as represented return for exchange or refund (our option) shipping charged prepaid within 5 days of receipt. Illinois residents must add 5% sales tax. Personal checks must clear before shipment. All items sent shipping charges collect unless otherwise agreed. Accessories do not include crystals, relay or antennas.

SOLID STATE SURPLUS

PROUDLY announces

IT'S 1st CATALOG

DEAR CUSTOMER

This month we've added another linear to our repertoire. . .the 531 fast op amp. With a slew rate of 35 V/microsec (unity gain), this one is a standout performer on high-frequency signals where the standard kind just poop out.

We've got other op amps too. . .the 3900 quad Norton Amp, 4 single-supply, current differencing op amps in a 14 pin dip. Use them to amplify, oscillate, generate ramps, as logic elements, or to compare; wherever you need a set of inexpensive, reasonable quality op amps. There's also the 4250, a micropower performer in a TO-5 package. This one draws current in microamps, not milliamps, but still retains good op amp performance characteristics. You can run it off of two 1.5 volt pencells just fine, so if you're thinking of any battery-operated stuff, this is the one. On the other hand, if you don't need anything special, there's always the 741, 747 (two 741s in a single package) and the 1558 (two 741s in a single package, but without offset null connections); we've got them, too.

Of course you need power supplies, and we can help there too. We've got the 309K, which basically gives a solid 5 volts at 1 amp out. . .however, most people don't know that the 309 can also give regulated voltages at more than 5 volts; also, it can act as a current limiter. (Our data sheets tell you how.) Probably everyone is familiar with the 723, another one of our favorites; a very versatile regulator with high precision and stability, current up to 150 mA, and a number of protective features.

SOLID STATE SURPLUS
BOX 255
MONTE RIO CA 95462

One of the more interesting ICs to come our way is the 339 quad comparator. Comparators have always been sort of uninteresting compared to glamor ICs like function generators, hi-slew op amps and the like; but the 339 opens up new design possibilities. It draws under 1 mA for all four comparators, and sinks about 10 mA (great for driving LEDs). Use it to monitor voltages in your equipment, to generate time delays, or even to provide a LED meter. We've also got the 311 comparator, slightly faster, and it can drive 50 mA referenced to either the positive supply, negative supply, or ground.

We've also got the 555 timer you ve read so much about.

Our policy? Air mail whenever possible and fast turnaround on orders. If we're out of something (which hasn't happened yet) we send back your check rather than backorder. Our data sheets tell all, and we try to keep them interesting.

No, we don't give you a broad line of parts. You'll have to get your CMOS somewhere else for the time being, but by selectively concentrating on the most popular hobby-oriented parts, you get lower prices, faster service, and parts that are guaranteed functional.

SOLID STATE SURPLUS

LM 309K 15V 1A regulator $1.20
LM 311M high performance comparitor $1.00
LM 339 dip quad comparitor $1.50
LM 555 timer $.85
LM 723D adjustable precision voltage regulator $.65
LM 741 Mini compensated op amp $ .45
LM 747 dip dual 741 $.70
LM 3900 dip quad op amp $.45
LM 4250 TO5 programable op amp $2.00
LM 1558 mini dip dual 741 $.75
NE531 minidip hi slew op-amp $1.25

ABOVE MATERIAL IS GUARANTEED FUNCTIONAL, RETESTED MATERIAL. USER SATISFACTION GUARANTEED FOR HOBBY AND EXPERIMENTAL APPLICATIONS.

SOLID STATE SURPLUS
BOX 255
MONTE RIO CA 95462

IT ONLY HAPPENS ONCE IN A LIFETIME!

NORELCO VIDEO TAPE RECORDER-PLAYBACKS

- WEIGHS ONLY 26 POUNDS
- LONG LIFE FERRITE HEADS
- EXTREMELY QUIET
- USES INEXPENSIVE ½" TAPE
- HORIZ RESPONSE 2½ MHz
- OPERATES FROM 110 VOLT AC
- STANDARD AUDIO-VISUAL SIGNALS IN/OUT
- 1 HOUR ON 2400 FOOT TAPE 7" REEL
- SOME MODIFIED WITH LIGHT INDICATE UNIT IN USE

MATCHING TV RECEIVER MONITOR – ALL SOLID STATE 12" DIAG. $189.50 P43M
SAVE $100 ON COMBO
LDL-1000 & P43M **$488.00**
NO WARRANTY
OFFER VOID AFTER OCT. 1, 1974

tape *YOUR FAVORITE TV SHOWS....*

build *AN INEXPENSIVE LIBRARY OF THE TV SHOWS YOU LIKE BEST...*

7" Reel 2400' ½" VIDEO TAPE IN BOX. New American Made $15.00 each. Minimum Order 5. Limited Quantity.

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- **Rated for continuous service**
- **VSWR Protected For Any Load (0-oo ohms)**
- **Reverse Current Protection**
- **Micro-Strip Inductors For Stability**

P15A1	P50A10	P100A10	P100A20
1-3 Watts In	2-18 Watts In	2-12 Watts In	18-25 Watts In
12-20 Watts Out	14-60 Watts Out	40-110 Watts Out	90-120 Watts Out
$55	**$98**	**$198**	**$145**

M-TECH Amplifiers Are In Stock At Communications Unlimited.

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008A MINICOMPUTER KIT
8008 CPU, 1024 x 8 bit memory; memory is expandable. Kit includes manual with schematic and programming suggestions, wire-wrap board and wiring list, and power supply parts. **$375.00**

MANUAL ONLY, $25.00

TTL

7400	$ .25	7485	$1.40
7401	.25	7486	.50
7402	.25	7489	3.25
7403	.25	7490	1.00
7404	.30	7492	1.00
7405	.30	7493	1.00
7406	.50	7495	1.00
7407	.50	7496	1.00
7408	.30	74107	.60
7409	.30	74121	.60
7410	.25	74122	.60
7411	.30	74123	1.10
7413	.90	74125	.65
7416	.50	74126	.65
7417	.50	74141	1.25
7420	.25	74150	2.50
7430	.25	74151	1.10
7432	.30	74153	1.40
7437	.50	74154	1.70
7438	.50	74157	1.40
7440	.25	74161	1.90
7442	1.10	74163	1.90
7446	1.45	74164	2.00
7447	1.45	74165	2.00
7448	1.45	74166	2.00
7450	.25	74174	2.20
7451	.25	74175	2.20
7453	.25	74176	1.60
7454	.25	74177	1.60
7473	.50	74181	4.50
7474	.50	74192	1.75
7475	1.00	74193	1.50
7476	.65	74195	1.15
7483	1.25	74200	9.00

1N914 EQUIVALENT DIODES
$ .10 $8/100

PS 25-1 Zero to 25 volt 1 amp lab type power supply with adjustable current limiting; has remote sensing and remote programming for voltage and current. Instructions included. All parts supplied except chassis and meter(s).
Kit of parts with schematic, $14.95

P.C. boards available, $3.00

LT-1 Digital logic tester, uses 5 volts, will test TTL, DTL & CMOS. Has internal slow clock. All parts supplied except power supply, chassis, panel and board.
Kit of parts with schematic, $19.95

"THE CUBE" Fully assembled subaudible tone generator for your small hand-held or portable FM radio. Works on 9-6 volts; no moving parts; set on any frequency between 98 and 240 Hz with a trim resistor. 0.5" x 0.6" x 0.7"
$19.95

Set on frequency by the factory, $5.00 extra.

PS 5-1 5 volt 1 amp regulated power supply kit with p.c. board and instructions. Board measures 2" x 6"; completed kit is 2" high. Transformer has internal r.f. shield. $8.00

TRANSISTORS	1–9	10+
NPN TO-18 gen. purpose silicon	$ .15	$ .10
PNP TO-18 gen. purpose silicon	.15	.10
2N2222 (NPN) TO-18	.25	.20
2N2907 (PNP) TO-18	.25	.20

JUNCTION FETs, TO-18 case

N-CHANNEL:	SIMILAR TO:	
NJF10	2N4416, MPF102	3/$1.00
NJF11	2N4091-93	4/$1.00
NJF12	2N4338-41	4/$1.00
NJF13	2N3089	3/$1.00
NJF14	2N4221-22	4/$1.00
P-CHANNEL:		
PJF11	2N3382-86	4/$1.00
PJF14	2N2608	4/$1.00

All FETs come with data sheets.

¼ WATT RESISTORS $ .05
$4/100
We have most 10% values.

WIRE WRAP SOCKETS
14 pin $ .55
16 pin .65
24 pin 1.30
28 pin 1.40
40 pin 1.85
wire-wrap socket pins
$ .05 $4/100

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LED 10R – Ten discrete red lens LEDs, various MV5020 types – $1.50
LED 10C – Ten discrete clear lens LEDs, various MV5020 types – $1.50

Application note included.

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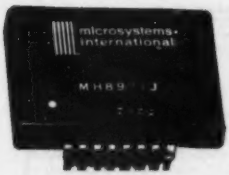
DISCOUNTS: 10% OFF ORDERS OVER $25.00; 20% OFF ORDERS OVER $250.00.



The Hybrid Analog TONE GENERATOR

MH8913J $18.00

DATA and APPLICATION SHEETS FURNISHED WITH ORDER

general specifications

Frequency Drift(1): < 1.5%

Group Amplitude Stability: ±25%

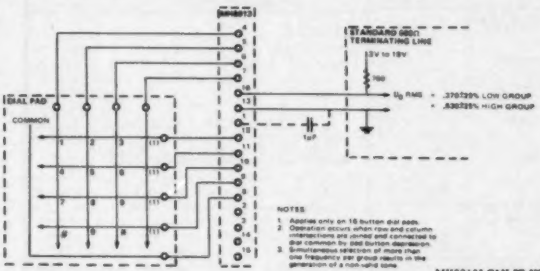
Total Distortion (Harmonic + Intermodulation): < 5% (relative to level of fundamental frequencies)

Typical Rise Time to Specified Output and Frequency:
1) Frequency selected, power supply switched < 5ms
2) Power applied, frequency selector switched < 2ms
3) Power applied, frequency within same group changed < 2μs

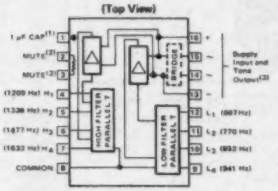
features

- Dual Frequency Capability
- Standard Telephone Tone-Dial Frequencies: Low Group – 697, 770, 852, 941 Hz; High Group – 1209, 1336, 1477, 1633 Hz
- Specification Ratings Exceed CCITT Recommendations

typical circuit connection diagram


(MH8913J)
DIAL PAD
COMMON
STANDARD 600Ω TERMINATING LINE
12V to 18V
1μF
NOTES:
1. Applies only on 16 button dial pads.
2. Operation occurs when row and column interconnections are closed and connected to dial common by pad button depression.
3. Simultaneous selection of more than one frequency per group results in the generation of a non-valid tone.

block diagram and pin configuration



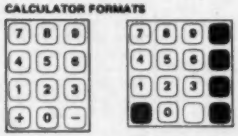
MH8913J CAN BE USED WITH CHOMERICS #ER21624 TOUCH TONE KEYBOARD

CHOMERICS

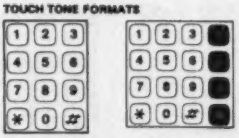
QUICKEY® TACTILE KEYBOARDS

FORMATS
Standard legends are black and white set in Standard Medium type.

CALCULATOR FORMATS

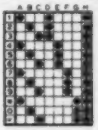


TOUCH TONE FORMATS

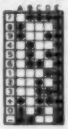


CODING

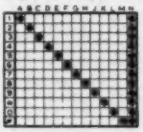
Touch Tone 12 Key



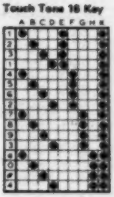
BCD 12 Key



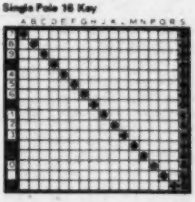
Single Pole 12 Key



Touch Tone 16 Key



Single Pole 16 Key



1/2" centers Model #	Price	3/4" centers Model #	Price	Format	Coding	# of Keys
ER 21622	7.15	ER 21605	7.70	Touch tone	Single pole	12
ER 21623	8.70	ER 21606	9.25	Touch tone	Touch tone	12
ER 21624	9.25	-	-	Touch tone	Direct to MH8913	12
-	-	ER 21607	7.70	Calculator	Single pole	12
-	-	ER 21608	11.00	Calculator	BCD	12
ER 21625	8.70	ER 21609	9.25	Calculator	Single pole	16
-	-	ER 21610	9.25	Touch tone	Single pole	16
-	-	ER 21611	11.15	Touch tone	Touch tone	16

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7-SEGMENT READOUT

12-PIN DIP

- Three digits with right-hand decimal
- Plugs into DIP sockets
- Similar to (LITRONIX) DL337
- Magnified digit approximately .1"
- Cathode for each digit
- Segments are parallel for multiple operation
- 5 - 10 MA per segment BRAND NEW

EACH $3.00 4 (12 Digits) $11.00

RCA NUMITRON

EACH.....$ 5.00

SPECIAL: 5 FOR $20.00

DR2010

Potter & Brumfield

TYPE KHP RELAY 4 PDT 3A CONTACTS

24 VDC (650 coil)....$1.50

120 VAC (10.5 MA coil).... 1.75

Power Supply SPECIAL!

723 DIP variable regulator chip 1-40V, + or - output @ 150 MA 10A with external pass transistor--With diagrams for many applications.

EACH....$1.00 10 FOR....$8.95

CT5005 CALCULATOR

This calculator chip has a full four-function memory, which is controlled by four keys, +M (adds entry into memory), -M (subtracts entry from memory), CM (clear memory, without clearing rest of registers), RM (read memory or use as entry).

- 12-Digit display and calculate
- Fixed decimal at 0, 1, 2, 3, 4, or 5
- Leading zero suppression
- 7-Segment multiplexed output
- True credit sign display
- Single 28-pin chip

CHIP AND DATA.....ONLY $14.95

DATA ONLY (Refundable)..... 1.00

5001 CALCULATOR

40-Pin calculator chip will add, subtract, multiply, and divide. 12-Digit display and calculate. Chain calculations. True credit balance sign output. Automatic over-flow indication. Fixed decimal point at 1, 2, 3, or 4. Leading zero suppression. Complete data supplied with chip.

CHIP AND DATA.....ONLY $9.95

DATA ONLY (Refundable).... 1.00

5002 LOW POWER CHIP AND DATA..12.95

All ICs are new and fully-tested; leads are plated with gold or solder. Orders for $5 or more will be shipped prepaid. Add 35¢ for handling and postage for smaller orders; residents of California add sales tax. IC orders are shipped within 2 workdays--kits are shipped within 10 days of receipt of order. $10.00 minimum on C.O.D.s (phone in).

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CTμL SPECIAL:

Complementary Transistor Logic

This logic family is unique in that both NPN and PNP transistors are combined in the same package. Unlike TTL and DTL, the outputs are current sources (in the high state) as well as sinking current in the low state. Those are brand new units, some of which are mis-marked with DTL numbers.

CTL 9956 dual 2-input AND buffer
CTL 9953 2-2-3input AND/OR gate
CTL 9952 dual 2-input NOR gate

Data supplied; all parts are dual-in-line.

MIX OR MATCH 5 FOR $1.00

LED's

MV50 red emitting 10-4 ma @ 2V $ .20 10 FOR 1.25

MV5024 red TO-18 high dome $ .35 10 FOR 2.95

MV10B visible red 5-7 ma @ 2V $ .30 10 FOR 2.50

CMOS

CD4001	$ .75	74C20	.75
CD4002	.75	74C160	3.25

3-Amp Power Silicon Rectifiers Marked Epoxy Axial Package

PRV	PRICE	PRV	PRICE
100.....$	.10	800.....$	.30
200.....	.15	1000....	.40
400.....	.18	1200....	.50
600.....	.23	1300....	.65

MAN 1

7-Segment, 0-9 plus letters. Snaps in 14-pin DIP socket or Molex. Operates with IC voltage requirements. Long operating life. ONLY $3.25

7400	$ .25	74L51	$ .30
74H00	.35	74H51	.35
7401	.20	7453	.20
74H01	.35	7454	.25
7402	.35	74L54	.35
7403	.30	74L55	.35
7404	.28	7460	.20
74H04	.35	74L71	.30
7405	.28	7472	.40
7406	.70	74L72	.50
7408	.35	7473	.60
74H08	.35	74L73	.75
7410	.25	7474	.65
74H11	.35	74H74	.80
7413	1.25	7475	1.40
7417	.40	7476	.60
7420	.25	74L78	.80
74L20	.35	7480	.65
74H20	.35	7483	1.00
74H22	.35	7489	4.00
7430	.25	7490	1.20
74H30	.35	7492	.90
74L30	.40	7493	1.15
7440	.25	7495	1.15
74H40	.35	74L95	2.00
7441	1.25	74107	.70
7442	1.20	74121	1.25
7446	1.75	74154	2.30
7447	1.50	74193	1.50
7448	1.50	74195	1.00
7450	.25		
74H50	.35		
7451	.25		

7400 Series DIP

RECTIFIERS

VARO FULL-WAVE BRIDGES

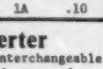
V5447	2A	400V	$ .90
V5647	2A	600V	1.10
MR810 Rect.		50V 1A	.10

Special 811: Hex Inverter

TTL DIP Hex Inverter; pin interchangeable with SN 7404. Parts are brand new and are branded Signetics and marked "811."

Data Sheet Supplied

EACH.....$ .30
10 FOR..... 2.50
100 FOR.... 23.00
1000 FOR... 220.00



MAN 3

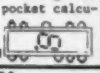
0-9 plus letters. Right-hand decimal point. Flat-pack type case. Long operating life. IC voltage requirements. Ideal for pocket calculators!

EACH $1.25
10 OR MORE 1.00

MAN4

Seven-segment, 0-9 plus letters. Right-hand decimal point. Snaps in 14-pin DIP socket or Molex. IC voltage requirements. Ideal for desk or pocket calculators!

EACH.....$2.75
TEN OR MORE 2.50 EACH



CD-2 Counter Kit

This kit provides a highly sophisticated display section module for clocks, counters, or other numerical display needs. The unit is .8" wide and 4 3/8" long. A single 5-volt power source powers both the ICs and the display tube. It can attain typical count rates of up to 30 MHz and also has a lamp test, causing all 7 segments to light. Kit includes a 2-sided (with plated thru holes) fiberglass printed circuit board, a 7490, a 7475, a 7447, a DR 2010 RCA Numitron display tube, complete instructions, and enough Molex pins for the ICs . . NOTE: boards can be supplied in a single panel of up to 10 digits (with all interconnects); therefore, when ordering, please specify whether you want them in single panels or in one multiple digit board. Not specifying will result in shipping delay.

COMPLETE KIT, ONLY $11.95

FULLY-ASSEMBLED UNIT $15.00

Boards supplied separately @ $2.50 per digit.

LINEARS

NE540	70-Watt power driver amp	$2.00
NE555	Precision timer	1.50
NE560	Phase lock loop DIP	3.25
NE561	Phase lock loop DIP	3.25
NE565	Phase lock loop TO-5	3.25
NE566	Function generator TO-5	4.00
NE567	Tone decoder MINI DIP	4.00
NE567	Tone decoder TO-5	3.00
NE5558	Dual 741 op amp MINI DIP	1.00
709	Popular Op Amp DIP	.45
710	Voltage comparator DIP	.75
711	Dual comparator DIP	.40
723	Precision voltage regulator DIP	1.00
739	Low noise op amp DIP unmarked	1.00
741	Op amp TO-5/MINI DIP	.55
747	Dual 741 op amp DIP	1.00
748	Op Amp TO-5	1.00
CA3018	2 Isolated transistors and a Darlington-connected transistor pair	1.00
CA3026	Dual differential amp	1.00
CA3045	5 NPN transistor array	1.00
LM100	Positive DC regulator TO-5	1.00
LM105	Voltage regulator	1.25
LM302	Op amp voltage follower TO-5	1.25
LM308	Op Amp TO-5	2.00
LM309H	5V 200 MA power supply TO-5	1.00
LM309K	5V 1A power supply module TO-3	2.00
LM311	Comparator TO-5	1.75
LM370	AGC amplifier	2.00
LM380	2-Watt Audio Amp	1.75
LM1595	4-Quadrant multiplier	2.00
MC1536T	Op Amp	2.00

NOW AVAILABLE! TRIACS From SSSI

The Hutson line of sensitive gate and regular gate triacs are designed to be driven directly with IC and MOS devices. These triacs feature proprietary, void-free glass passivated chips and are hermetically sealed in TO-5 and Isotab packages.

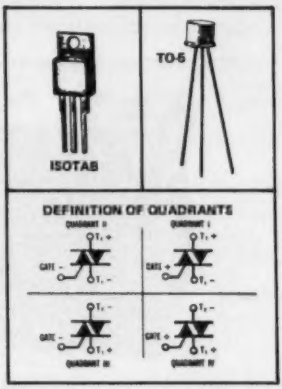
These 3–15 Ampere triacs are available in voltage ratings from 50 to 400 Volts (VDROM) and in 3mA or 50mA (I_{GT}) ratings. All devices are tested at their upper operating limits before shipment.

The economical and highly reliable triacs are the result of Hutson's advanced engineering and manufacturing technology, state-of-the-art passivation materials and techniques and experience in switching device applications.

Hutson triacs are bi-directional triode thyristors and may be switched from off-state to conduction for either polarity of applied voltage with positive or negative gate-trigger current. They are designed for control applications in lighting, heating, cooling and static switching relays.

PRICE LISTING

Catalog Number	Description of Item	Any Quantity Per Item (Mix) 1-99	100-999	1000-up	Multiples of 10 Per Item (Mix) 100-990	1000-9990	Grouping Code
45-03003	3mA Gate 50V 3 Amp. TRIAC	1.69	1.62	1.54	1.46	1.39	30
45-03203	3mA Gate 200V 3 Amp. TRIAC	2.18	2.08	1.98	1.88	1.78	30
45-03403	3mA Gate 400V 3 Amp. TRIAC	2.73	2.60	2.48	2.36	2.23	30
45-10003	10mA Gate 50V 3 Amp. TRIAC	1.36	1.30	1.24	1.18	1.12	30
45-10203	10mA Gate 200V 3 Amp. TRIAC	1.76	1.68	1.60	1.52	1.44	30
45-10403	10mA Gate 400V 3 Amp. TRIAC	2.20	2.10	2.00	1.90	1.80	30
45-25003	25mA Gate 50V 3 Amp. TRIAC	1.10	1.05	1.00	.95	.90	30
45-25203	25mA Gate 200V 3 Amp. TRIAC	1.54	1.47	1.40	1.33	1.26	30
45-25403	25mA Gate 400V 3 Amp. TRIAC	1.98	1.89	1.80	1.71	1.62	30
45-50010	50mA Gate 50V 10 Amp. TRIAC	1.08	1.03	.98	.93	.88	30
45-50015	50mA Gate 50V 15 Amp. TRIAC	1.69	1.62	1.54	1.46	1.39	30
45-50210	50mA Gate 200V 10 Amp. TRIAC	1.76	1.68	1.60	1.52	1.44	30
45-50215	50mA Gate 200V 15 Amp. TRIAC	3.01	2.88	2.74	2.60	2.47	30
45-50410	50mA Gate 400V 10 Amp. TRIAC	2.22	2.12	2.02	1.92	1.82	30
45-50415	50mA Gate 400V 15 Amp. TRIAC	3.81	3.63	3.46	3.29	3.11	30
46-50010	50mA Gate 50V 10 Amp. TRIAC	.97	.92	.88	.84	.79	30
46-50015	50mA Gate 50V 15 Amp. TRIAC	1.52	1.45	1.38	1.31	1.24	30
46-50210	50mA Gate 200V 10 Amp. TRIAC	1.58	1.51	1.44	1.37	1.30	30
46-50215	50mA Gate 200V 15 Amp. TRIAC	2.71	2.58	2.46	2.34	2.21	30
46-50410	50mA Gate 400V 10 Amp. TRIAC	2.00	1.91	1.82	1.73	1.64	30
46-50415	50mA Gate 400V 15 Amp. TRIAC	3.37	3.21	3.06	2.91	2.75	30



SPECIFICATIONS

Electrical Characteristics & Maximum Ratings		Catalog Number							Unit
Repetitive Peak Off-State Voltage, Gate Open and TJ=100°C	50	45-03003	45-10003	45-25003	46-50010	45-50010	46-50015	45-50015	VOLT
	200	45-03203	45-10203	45-25203	46-50210	45-50210	46-50215	45-50215	VOLT
	400	45-03403	45-10403	45-25403	46-50410	45-50410	46-50415	45-50415	VOLT
RMS On-State Current at TC=75°C and Conduction Angle of 360°		3	3	3	10	10	15	15	AMP
Peak Surge (Non-Repetitive) On-State Current, One-Cycle, at:									
60 Hz		30	30	30	110	110	150	150	AMP
50 Hz		30	30	30	90	90	125	125	AMP
Peak Gate-Trigger Current for 3μsec. Max.		1	1	1	4	4	4	4	AMP
Peak Gate-Power Dissipation at IGT ≤ IGTM for 3μsec. Max.		20	20	20	20	20	20	20	WATT
Average Gate-Power Dissipation		0.2	0.2	0.2	0.2	0.2	0.2	0.2	WATT
Peak Off-State Current, Gate Open at TJ=100°C		0.75 Max.	0.75 Max.	0.75 Max.	2	2	2	2	mA
Maximum On-State Voltage at TC=25°C and it=Rated Value		2.20 Max.	2.20 Max.	2.20 Max.	1.8	1.8	1.8	1.8	VOLT
DC Gate-Trigger Current at 25°C for VD=24 VDC, RL=12Ω									
Quads I & III					50	50	50	50	mA
Quads II & IV					80	50	80	50	mA
VD=6 VDC, RL=39Ω									
Quads I & III		3 Max.	10 Max.	25 Max.					mA
Quads II & IV		3 Max.	10 Max.	25 Max.					mA
DC Gate Trigger Voltage for VD=24 VDC, RL=20Ω and at TC=25°C					2.2	2.2	2.2	2.2	VDC
DC Gate-Trigger Voltage for VD=6 VDC, RL=39Ω and at TC=25°C		2.2 Max.	2.2 Max.	2.2 Max.					VOLT
Storage Temperature Range		-40 to +150							°C
Operating Temperature Range, TC		-40 to +90	-40 to +100						°C
Case Type		TO-5	TO-5	TO-5	Isotab	Isotab	Isotab	Isotab	

SEND YOUR ORDER TO:

SOLID STATE SYSTEMS, INC.
P. O. BOX 617
COLUMBIA, MISSOURI 65201

CALL OUR ORDER DESK (TOLL FREE): 800-325-2595 & 800-325-2981

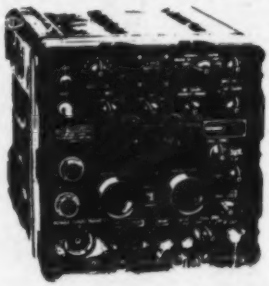
ANOTHER SELECTRONIC SPECIAL
For This Issue Only
RADIO RECEIVER R–392/URR

Freq. Range: 500 KC to 32 MC in 32 bands. Types of Signals Received: CW, MCW, Voice (AM) and Freq. Shift Radio Teletypewriter. Type of Tuning: Continuous: Freq. Read Directly on Counter–Type Freq. Indicator. Method of Calibration: Built-in crystal Calibrator. Calibration Points: Every 100 KC. Nominal Input Voltage: 28 Volts DC; will operate on an input of 25 to 30 V.

PRICE: $195.00 **F.O.B. Philadelphia, PA**

Shipping Wt. 50 lbs. *(with schematic)*

With schematic, checked and guaranteed.



We will include with every purchase the following accessories for the above receiver – **FREE**

1 Whip Antenna
1 Speaker
1 Mike
1 Set Connecting Cables
1 Head Set
1 Telegraph Key

We have a few of the R-392/URR Receivers that need minor repairs, good shape as is, physically complete. **$125.00**

ADJUSTABLE PRINTED CARD BOX
For Rack Mount
5" to 7¼" – 16 slides and sockets – includes 30 double contact position edge connector type
PRICE $9.95

MODERN ALUMINUM BENCH RACK CABINET
11½" H x 18" D x 19" W. 8" panel openings w. rubber feet and disappearing handle.
Lt Blue Price: $7.95 ea.

Triad transformers F-21A 115 Volts 60 cycles 6.3 VCT at 10 Amps. **Price: $4.95.**

R-508 VHF RECEIVER
118-148 MHz, part of ARC-60 aircraft radio set. Front panel tuning 118-148 MHz, lightweight, compact, 5" x 6" x 12". 28 VDC input, 250V, 50mA, dynamotor. **Price: $14.95**

DIGITAL READOUTS SETS
Make your own counter, frequency meter, digital voltmeter, readouts, etc. Includes 6-B 5031 mixes w/sockets (.6" character height), 1 transformer, 1 p/s board with socket.
Price: $12.95, 2/$20.00
Small B-5031 nixies no board w/socket 4/$5.00

ANOTHER SPECIAL
LARGE ALPHA NUMERIC READOUTS
Two B7971 tubes in sockets, driver transistors and components all on one board – can be used for clocks, counters, numerous other uses. . . .
Price: $2.00 a board, 3/$5.00

SOCKETS
Sockets for 4 x 150's – 2 sockets with chimney, mounted on aluminum chassis
Price: $7.00

MODULE TYPE P/S
AC input 95-125 VAC-60Hz-100 watts.

+12VDC@	.375A
-12VDC@	3 AMP.
- 6VDC@	.375A

Regulation 1%. Front panel adj. ±10%. 5 1/8" x 7 3/8" x 7"
Price: $14.95, 2/$25.00

Lighted switches 2 pdt push pole panel mount 5/8" hold.
Price: $1.00 each, 6/$5.00

TRIAD TRANSFORMER – F-22 115 volts, 60 cycles 6.3V ct at 20 amps. **$5.95**
4 x 150 D 28 volt filament **$5.95, 2/$10.00**

TORCiD INVERTER
P/S high efficiency, equipped with cooling and for continuous duty. Input 27.5V at 5.5 amps, output 250 VDC at 300 mA, 45 VDC at 10 mA, 115 VAC 400 cycle at 30 VA. 3" round by 8 3/4" long. 6 lbs. **$9.95**

ANOTHER TOROID INVERTER
Input 27.5 V at 23 amps. Output 1000V at 500 mA. 4" round x 8½" long. 8 lbs. Both inverters operate on 12 VDC one half voltage output. **$14.95**

METERS – 1 3/4 square, 1½ hole mount - 1" behind panel. 0–25 mA FS. **$2.50**

ADAPTERS BNC to SO–239 **2/$1.00**

ALL PRICES ARE F.O.B. OUR WAREHOUSE, PHILADELPHIA, PA. ALL MERCHANDISE DESCRIBED ACCURATELY TO THE BEST OF OUR KNOWLEDGE. YOUR PURCHASE MONEY REFUNDED IF NOT SATISFIED. TERMS ARE CASH. MIN. ORDER $5.00. ALL MERCHANDISE SUBJECT TO PRIOR SALE. RFE – REMOVED FROM EQUIPMENT.

SELECTRONICS

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215-468-7891 215-468-4645

CALCULATOR KIT

Kit contains NORTEC calculator chip 4024,21 driver transistors, 8 LED's, 7 segment readout by EXITON, 3 LED for overflow, low btry, over-range, a keyboard by FLEX KEY. All this $45 value for only ..... $16.50 2 for $27

BASIC CLOCK KIT

We furnish clock chip CT7001 and 4 first line LED readouts .3 inch hgt. You furnish the misc. minor parts. A $35 value for $19.95

LIQUID CRYSTAL WATCH

Build a wrist watch or desk clock with this liquid crystal display. Recently written up in several magazines. Display with special socket reads hours and minutes ..... $15 2 for $25

UNDERWATER LISTENING

Brand new by OLIN. Use it for a swim pool monitor-alarm, use it on lake or ocean listening to underwater noises, fish, etc. Complete with hydrophone, 50 ft. mike cable, speaker-amplifier console. Operates from 115 volts AC or 15 volt dry cells. 12 lbs. $25

CALCULATOR CHIPS

5001 LSI (40 pin) Add, subtract, multiply divide 12 digit. With data $6.95
Data alone ..... 50 cents

CMOS 4814 HEX INVERTER

CMOS HEX INVERTER, dual inline package. 3-18 volt range, dual diode protection against static charge. Dielectrically isolated complimentary MOS. $1.00 each 12 for $10.00

DUAL 16 BIT MEMORY

Dual 16 bit memory, serial MOS by Philco TO-5 case, brand new with 2 page specs.
#PLR 532 $1.00 each $10/12

AM-FM RADIO $5.50

Due to the West Coast ship strike they came in too late for the customer. Now it's your bargain. Use it as is or build it into your own cabinet, desk, wall, etc. All built, ready to use, with AC supply. To make it portable all you do is power it with a couple of "D" cells. Fully assembled solid state chassis with AC power supply, less speakers. Covers full AM as well as FM broadcast. The price . . . an astounding meager $5.50

FLEX–KEY KEYBOARD FOR POCKET CALCULATORS $1.50

POWER AMP XFMR 380 WATT

115 volt input, 64 VCT 6 amp output.
$11.95 each, 2/$22, 5/$50

COLUMBIA 4 CHANNEL SQ

Solid state SQ 4 channel adapter, 2 amps built in. Decodes 4 channel or synthesizes 4 channel. $35.00

LED READOUTS $.20!

The price is not a mistake. We have some hobby variety with some segments out. Ukinbuyem for as low as 5 for $1.00

PHOTO STROBE

For use with most Instamatic cameras. With nicad battery and built-in charger. Never buy flash cubes again. $9.95

AM–FM RADIO

For console installation, w/face plate, no knobs. Stereo amplifiers for tape or turnable playback. $15.00
Pair of matching speakers w/xfmrs for above $5.00

CALCULATOR CHASSIS

Fully assembled pocket calculator chassis with calculator chip. Uses LED readouts not included. $5.00

ELECTRIC SIREN $10.00

Brand new, operate 6 or 12 volts dc. Just the thing to protect car or boat. Used also as burglar or fire alarm in house & camp. Kinda scarce, but we found some. While they last $12 each, 2/$20.00

SOLAR ENERGY

Electricity for free from the sun. An exciting experimental device. Instructions included show how to make a solar energy bank for higher voltages and/or current, also how to make a solar operated radio receiver.

Giant cell 2" diameter – $1.50
Large cell 1 3/4" – $1.25
Medium cell 1" diameter – $1.00
Rectangular 3/4 x 1½" – $.75
Any six for the price of 5 . . .

BOOKSHELF SPEAKERS

Completely finished, 9 x 12 x 5 inches. 16 ohm, with extension cord. $15 a pair.

Meshna

Postage extra on above. **MESHNA PO Bx 62 E. Lynn Mass. 01904**
96-page catalog FREE!

7-SEGMENT LED Readouts

**By Opcos, equal to MAN-1 or MAN-4 specs. Color - RED. †Green. †† yellow

(All "LED" TYPES)

Type	Char.	Each	Special
☐ MAN-1	.27	$3.75	3 for $9.
☐ MAN-3	.12	1.49	3 for $3.
☐ MAN-4	.19	2.50	3 for $6.

REFLECTIVE BAR TYPES

☐ SLA-1**	.33	2.10	3 for $5.
☐ SLA-3**	.70	4.95	3 for $13.
☐ SLA-11**	.33†	3.50	3 for $10.
☐ SLA-31**	.33††	3.95	3 for $10.

PLASTIC VOLTAGE REGULATORS

☐ L-129	5V	500ma	$2.10
☐ L-130	12V	500ma	2.10
☐ L-131	15V	480ma	2.10

*TO-126 Package
Buy 3 — Take 10%

Brand New — OVER 1,000,000-PC INVENTORY

Buy 3 or more, 10% Discount

Inflation-Fighting ECONOMY IC PRICES

* Factory Marked — Order by type number! Spec sheets on request "ONLY" — Buy 100 — Take 20%

Type	Sale
☐ SN7400	$0.24
☐ SN7401	.24
☐ SN7402	.24
☐ SN7403	.24
☐ SN7404	.26
☐ SN7405	.26
☐ SN7406	.45
☐ SN7407	.49
☐ SN7408	.27
☐ SN7410	.24
☐ SN7411	.31
☐ SN7413	.89
☐ SN7416	.45
☐ SN7420	.24
☐ SN7421	.45
☐ SN7432	.31
☐ SN7438	.50
☐ SN7426	.33
☐ SN7430	.24
☐ SN7432	.35
☐ SN7437	.45
☐ SN7438	.52
☐ SN7440	.24
☐ SN7441	1.19
☐ SN7442	1.12
☐ SN7443	1.12
☐ SN7444	1.25
☐ SN7445	1.19
☐ SN7446	1.29
☐ SN7447	1.29
☐ SN7448	1.35
☐ SN7450	.27
☐ SN7451	.31
☐ SN7453	.31
☐ SN7454	.31
☐ SN7460	.26
☐ SN7462	.35
☐ SN7464	.43
☐ SN7465	.43
☐ SN7471	.85
☐ SN7472	.41
☐ SN7473	.49
☐ SN7474	.49
☐ SN7475	.85
☐ SN7476	.53
☐ SN7478	.85
☐ SN7480	.85
☐ SN7481	1.25
☐ SN7482	.99
☐ SN7483	1.15
☐ SN7486	.48
☐ SN7489	3.10
☐ SN7490	.85
☐ SN7491	1.35
☐ SN7492	.85
☐ SN7493	.85
☐ SN7494	1.05
☐ SN7495	1.00
☐ SN7496	1.00
☐ SN74100	1.65
☐ SN74107	.51
☐ SN74108	.93
☐ SN74112	.95
☐ SN74113	.95
☐ SN74114	.95
☐ SN74121	.61
☐ SN74122	.69
☐ SN74123	1.05
☐ SN74128	1.45
☐ SN74136	1.45
☐ SN74140	2.50
☐ SN74141	1.95
☐ SN74145	1.19
☐ SN74148	4.50
☐ SN74150	1.19
☐ SN74151	1.05
☐ SN74153	1.39
☐ SN74154	1.69
☐ SN74156	1.29
☐ SN74157	1.45
☐ SN74161	1.45
☐ SN74186	1.49
☐ SN74160	1.85
☐ SN74161	1.59
☐ SN74163	1.75
☐ SN74164	2.10
☐ SN74165	2.10
☐ SN74166	1.65
☐ SN74173	1.85
☐ SN74175	2.60
☐ SN74176	1.85
☐ SN74177	1.85
☐ SN74180	1.10
☐ SN74181	4.10
☐ SN74182	1.00
☐ SN74186	2.50
☐ SN74192	1.58
☐ SN74193	1.58
☐ SN74196	1.85
☐ SN74198	1.10
☐ SN74199	1.25
☐ SN74107	1.10
☐ SN74196	2.35
☐ SN74200	9.95

CLOCK CHIPS ON A "DIP" as Low as $7.77

☐ MM5311	6-digit	28-Pin	$7.77
☐ MM5312	4-digit	24-Pin	7.77
☐ MM5313	6-digit	28-Pin	7.77
☐ MM5314	6-digit	24-Pin	7.77
☐ MM5316	4-digit	40-Pin, Alarm	9.95

WITH DATA SHEETS

INTEGRATED CIRCUIT SOCKETS

Buy Any 3 Take 10% Discount!

☐ 14-Pin, DIP	$.45
☐ 14-Pin, Side Mount	1.00
☐ 16-Pin, DIP	.52
☐ TO-5, 8 or 10-Pin	.29
☐ 14-Pin, Wire Wrap	.69c
☐ 16-Pin, Wire Wrap	.89c

MALLORY SOLID STATE ALARM 'SONARLERT'

☐ Only 3 for $12 **$4.50**

Never before offered at these low prices. This unique intrusion alarm device may be used for 1000's of circuits where the voltage is 6 to 28 VDC. Responds to 3 mils with a sound output of 70 db. Mounts in 1-9/64" holes in panels up to ¼" thick. Type SC628 with color-coded leads. 2.9KHz. minus 40° to 85°C. Size: 1¼" x 1½".

INDUSTRIAL SPEED CONTROL ☐ $4.95

A $30 item from G.E. Model 533A (made for Xerox) that controls home, shop and industrial lighting too! A very elaborate circuit for controlling many electrical and electronic devices. Easily controls speeds of electric drills, brush type motors, etc. 115vac, rated at 1100 watts. With variable speed or dimming control in heavy-duty aluminum case. 3 x 2¾ x 2. With diagram and hookups.

SANKEN HYBRID AUDIO POWER AMPS

	Mfgr's Type	Watts	Sale
☐	SI-1010Y	10	$ 8.88
☐	SI-1025E	25	19.88
☐	SI-1050E	50	29.95

Used extensively in hi-fi systems, tape decks, FM tuners, record players, stereo components, musical instruments, P.A., etc. All amplifiers, flat within ½ db from 8a to 100,000. Each unit properly heat-sinked, with heavy-duty connecting tie lug connections. Single-ended pushpull output. Power supply required 24VDC. Output to 8 ohms. Order by Stock No.

HIGH POWER TRANSISTOR WITH HEAT SINK

3 for $3 ☐ **$1.49**

Removed from new equipment! Includes popular 2N174 'doorknob' transistor TO-36, germanium, PNP, 150 watts, VCBO 80V, 15 amps, 40 hfe. For ignition, high power transmitters, etc. Mounted on heat sink 5 x 2½ x 1¼".

NATIONAL LINEAR OP AMPS

Buy any 3 — Take 10%

(A) TO-5, Dip or mini Dip

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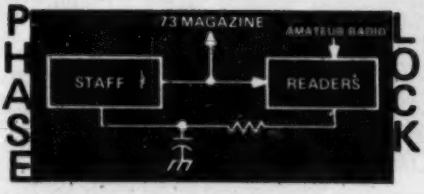

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①	②	③	④	⑤	⑥	⑦
⑧	⑨	⑩	11	12	13	14
15	⑯	⑰	⑱	⑲	⑳	21
22	23	㉔	㉕	㉖	㉗	㉘
㉙	㉚					

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GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7A	7	7	3	3	3	7	7	7	14	14
ARGENTINA	14	7A	7B	7	7	7	14	14	14	14	14A	14A
AUSTRALIA	14	7A	7B	7B	7	7	7	7	7	7B	14	14
CANAL ZONE	14	7	7	7	7	7	14	14	14	14	21	21
ENGLAND	7	7	7	7	7	7B	14	14	14	14	14	7B
HAWAII	14	7A	7B	7	7	7	7	7B	14	14	14	14
INDIA	7	7	7B	7B	7B	7B	14	14	14	7B	7B	7B
JAPAN	14	7B	7B	7B	7B	3B	7	7	7	7	7	14
MEXICO	14	7	7	7	7	3A	7	14	14	14	14A	14
PHILIPPINES	14	7B	7B	7B	7B	3B	7	7	7A	7A	7B	14
PUERTO RICO	7	7	7	7	7	7	14	14	14	14	14	14
SOUTH AFRICA	7	7	7	7	7B	14	14	14	14A	14A	14	14
U. S. S. R.	7	3	3	7	7	7B	7A	14	14	14	7B	7B
WEST COAST	14	7A	7	7	7	7	7	14	14	14	14	14

CENTRAL UNITED STATES TO:

ALASKA	14	14	7	7	3	3	3	7	7	7A	14	14
ARGENTINA	14	14	7B	7	7	7	7A	14	14	14	14A	14A
AUSTRALIA	14	14	7B	7B	7	7	7	7	7	7B	14	14
CANAL ZONE	14	14	7	7	7	7	7	14	14	14	21	21
ENGLAND	7	7	7	7	7	7	7B	14	14	14	14	7B
HAWAII	14	14	7B	7	7	7	7	7	14	14	14	14
INDIA	7	7	7B	7B	3B	3B	7B	7B	7A	7	7	7
JAPAN	14	14	7B	7B	3B	3B	3	7	7	7	7	14
MEXICO	14	7	7	7	7	3A	7	7A	14	14	14	14
PHILIPPINES	14	14	7B	7B	3B	3B	3B	7	7	7	7B	14
PUERTO RICO	14	7	7	7	7	3	14	14	14	14	14	14A
SOUTH AFRICA	7	7	7	7	7B	7B	14	14	14	14	14	14
U. S. S. R.	7	3	3	3	3	3B	7B	7B	14	14	7B	7B

WESTERN UNITED STATES TO:

ALASKA	14	14	7	7	3	3	3	7	7	7	7A	14
ARGENTINA	14	14	7B	7	7	7	7B	14	14A	21	21	14A
AUSTRALIA	21	21	14	7B	7	7	7	7	7	7B	14	14
CANAL ZONE	14A	14	7	7	7	7	7	14	14	14	14	21
ENGLAND	7	7	7	7	7	3B	7B	7B	14	14	14B	7B
HAWAII	14A	14A	14	7A	7	7	7	7	14	14	14	14
INDIA	7A	14	7B	7B	3B	3B	3B	7B	7	7	7	7
JAPAN	14	14	14	7B	7	7	3A	7	7	7	7A	14
MEXICO	14	14	7	7	7	7	7	7A	14	14	14	14
PHILIPPINES	14	14	14	7B	7B	7B	3A	7	7	7	7B	14
PUERTO RICO	14	7	7	7	7	7	7	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	3B	7B	14	14	14	14	14
U. S. S. R.	7B	3B	7	7	3	3B	3B	7	7A	7A	7B	7B
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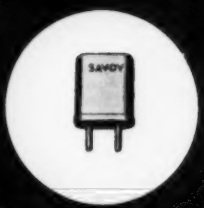

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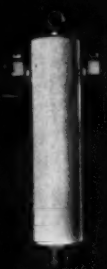

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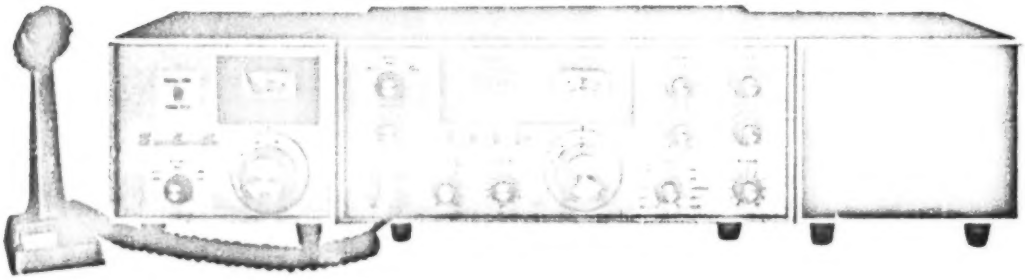

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